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MOTORAGE

Published Every Thursday by the CLASS JOURNAL COMPANY Mallers Building CHICAGO ILLINOIS

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Vol. XXXI Chicago

Chicago, June 28, 1917

No. 26

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ANNOUNCEMENT

As announced in a previous Issue HI Sibley, Motor Age's special representative, spent some time in Japan studying motor conditions and will write a series of articles to appear from time to time. The first of this series will be a feature of Motor Age next week.



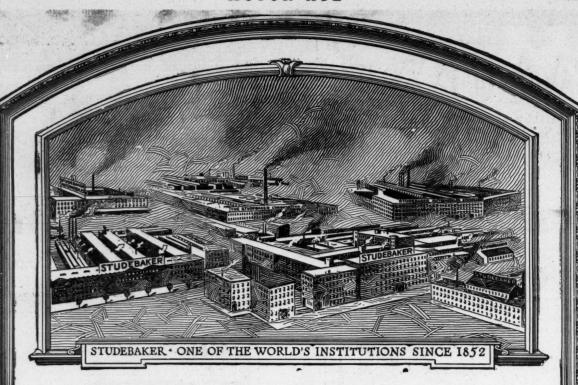
A car may largely be known and judged by the character of its electrical accessories—provided the investigator be well versed in the distinctive marks of quality. In the matter of magnetos and lighting generators, practice and precedent provide an unfailing index to dependability—

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MOTOR AGE

Permanent Roads an Economic



PERMANENT roads are an economic necessity and, to economic, appropriately may be added—military. So surely is this being impressed on the minds of governors, state highway officials and others interested in the successful prosecution of the good roads movement as a military necessity that effort is being made to have road material given priority over all other freight.

A Work of Providence

Last winter press dispatches carried a message that ran something like this: "Providence has been kind to the southern Indiana farmers this winter in that once in a life time the roads are frozen to a smooth condition and taking advantage of such roads, farmers are sending hogs to market 75 miles away in motor trucks. The hogs so enjoy their ride to death that they go to sleep on the way."

Of course, the writer of this dispatch

Cost of Moving 1 Ton 1 Mile by

		ent	S	
Water			1/4	
Rail		to	4/5	
Permanent roads.	5	to	12	
Dirt road	20	to	50	
Average cost of hauling farm				
products in U. S			23	

aimed to please the reader in the comedy of circumstance, but the lesson is so plain and impressive that the tragedy of present events ought to stir action. More is expected of us these days than putting manna in our mouths. When Providence is kind enough to point out so particularly and exactly the way, why need we be either dense or stubborn, much less careless and indifferent.

To-day conservation of resources is daily dinned into our ears. The military problem which confronts us is such that we must

bend every energy toward greater production and less waste. Railroads are showing their incompetency to handle shipments by freight as never before. Thousands upon thousands of tons of freight are now awaiting the insistent demand for cars in which to load. Thousands of cars are standing in the outer yards awaiting their turn for placement on some unloading track while others, patience and expensive delay no longer to be endured, are unloaded miles out of the city and the contents trucked to destination. Think what such a condition would mean were we facing a vastly more significant military problem here in our own country!

Rome Was a Road

Rome fed a million people with slowmoving ox-carts over her roads, but we have no Roman road; in fact, we have no roads when we think of the percentage of permanent roads as compared with our total mileage. Less than 12 per cent of our whole road system is surfaced, to say nothing of the relatively low percentage that may be said to be of a permanent character, for included in the 11 or 12 per cent of surfaced roads are the brick, concrete, macadam and asphalt.

We have sufficient stretches of permanent roads to create confidence in our ability to build them. We do not have to await a providential smooth-frozen surface. If progress in railroad building from the old iron-banded wooden stringer through stages of different gages up to the standard track and schedule of movement is still inadequate to serve the public need, how much less has been our progress in highway building.

Our main-traveled roads, at least our through trunk highways, should bear the same reliability for the truck, horse or gaspropelled, as a railway track bears to its loaded cars.

If there ever was a time in the history of this country when the building of roads on which heavier loads may be hauled at greater speed with reduced power cost, that time is now. In spite of this fact it is being urged in some quarters that construction work, including roads, should cease. Waste in haulage on rural roads has

already reached the appalling sum of more than \$300,000,000 a year. Where is the economy in curtailing road construction and thereby increasing instead of reducing waste?

The great cry is for more man power on our farms. At the same time we are wasting an amount of time in slow hauling on rough roads that would be equivalent, if applied to crop production, to an army of 1,000,000 men, statisticians tell us. National defense committees are taking drastic steps to eliminate delays in railway traffic-a system that may be termed a 15 per cent system. Where is the economy in working for higher efficiency on the 15 per cent end of the system-the railway-and reducing efficiency on the 85 per cent end -the rural road-by curtailing road construction? Here are seven reasons for permanent roads:

The efficiency of our industrial, commercial and agricultural activities should not be lessened or handicapped by war hysteria.

2—Our financial resources are in healthy condition; no stringency in the money market exists; the agricultural districts promise an unusual acreage and harvest yield; every pound of meat and bushel of

grain can be sold at profitable prices; none of the factors that usually contribute to business depression now exist.

3—Any policy of government that retards any useful activity will correspondingly harm other industries.

4—The one great economic need of the farm and farmer is improved highways that will assist in transporting products of the farm, field and garden to market.

5—The freight congestion in great centers of traffic creates imperative need for good highways to supplement railroads in transporting the product of the industrial and commercial world.

6—The European war already has demonstrated that good roads are powerful adjuncts in national defense in the movement of armies, war munitions and all military supplies.

7—Permanent roads are important factors in rural welfare, contentment and vitalizing of rural America.

Evidence of the most convincing character as to the needed types of roads is abundant upon which to exercise judgment in the building of dependable roads for the most exacting service. To hesitate over a program for immediate improving



Cleveland-Akron route, Cuyahoga county, Ohio-Vitrified brick country road through Twinsburg township

of such highways as will relieve the railroads of an excess tonnage and to extend mileage and connect stretches already in existence as quickly as possible is to be guilty of a criminal neglect approaching treason.

We must have permanent roads to sustain in virile condition the elements of national life and strength behind the firing line, but in no less degree can the highways be utilized in many eventualities for actual military requirements. Nor can the vicissitudes of war lessen by a single farthing the value of the dollar now expended; it will be one of continuous worth in the peaceful days to come.

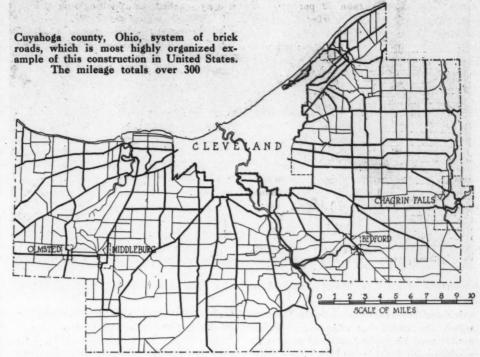
Mines have been idle, manufacturing plants have ceased operations for days, grain, so badly needed, remains in the farmers' cribs, and all business is disturbed. Reflecting results are felt in lessened efficiency on the one hand and higher prices for all purchases needed for our daily requirements on the other. Our whole industrial fabric is being sapped of the vitality that we need and upon which the great strength of the country rests and upon which we must depend for continued ability to endure the coming strain.

The United States Government feels the existence of this industrial condition by giving preferential right of way over railroads to commodities for direct and immediate war needs and very likely will include road-making materials in that category. As the necessities for war material become expanded the general industries of the country will be further disturbed by the increased use of present transportation facilities. This situation surely will become intensified by the great increase of crops so wisely urged upon the country, which must be moved if they are to serve the purpose of feeding the thousands now so anxiously hoping for a further lease of life thereby.

Question of Bread and Meat

It is quite apparent that transportation is no longer a problem of mere convenience; nor is it one of merely commercial advantage. It is now a question of bread and meat-and more. Upon it rests the hope of an early conclusion of the war. It is a question of vital and immediate concern for the salvation of the country; the guarantee of its ultimate endurance. In what manner and how shall relief come? Shall it be either a debate, or procrastination, or shall it come at all? If we have been unable to deliver a short crop how shall we deliver a long one? Without making any attempt to forecast what the possible construction of roads this year would do as a solution, it is evident to everyone that all-year roads are of vital importance and to that end some facts and figures concerning our present mileage of permanent roads and a word about our system in general are of interest.

The value of roads has been recognized since civilization began. The oldest roads of which parts still remain are those of the



Romans and those through France made by the Crusaders. The word "road" has an ancient derivation. It comes from the German word reiten, meaning "to ride," and is closely connected with the Gaelic word, reda, meaning "wagon."

In the ancient days the economic value of roads, in its broadest sense, did not enter into the equation. Commerce, travel, warfare and the development of military control of distant countries depended then as now on the length and quality of roads. In the olden days roads were developed chiefly to facilitate the movement of troops and not the development of commercial and social welfare. Is history repeating itself? We, as a nation, have come to realize that permanent roads are of great military advantage.

The first highways constructed in the Western Hemisphere of which there is record were built by the ancient Incas in Peru. The development of roads in America has been very much slower than in other countries. Our chief progress has been made since the advent of the motor vehicle, but the motor vehicle is far ahead of its time if we use our present roads as a gage of time. In the colonies in the East the people came from England where the roads were very bad and hence did not realize the value of improved highways. The generations that followed them seem to have been as slow to realize the importance of high-

Tractive Resistance

Pounds pull over various			1 ton
Loose sand .	 	280	to 350
Loose gravel	 		
Dry gravel .	 		258
Best gravel .	 		to 100
Dry dirt			to 150
Best dirt			106
Macadam			to 60
Asphalt			to 60
Concrete			to 60
Brick	 	40	to 60

ways; perhaps it has been an inherited trait.

The first important highway in the Colonies was the old York road of 1711, which connected New York with Philadelphia. No less a person than the Father of Our Country, George Washington, laid out the first military road in this country in 1754, which led from Virginia across the Alleghenies to the Ohio Valley. Organized road making, however, did not begin until 1800. The first turnpike in the country and the first macadam road in the United States was the Lancaster Turnpike between Lancaster and Philadelphia, Pa.

Where Brick Roads Are Necessary

The early turnpikes were owned and managed by private corporations and when financial difficulties arose, which was often, the roads reverted to the state. The first national road was started in 1811. This road, known as the Cumberland or National road, connected Cumberland, Md., with the Ohio and Mississippi rivers. It was 700 miles long and cost the government \$7,000,000. There have been in this country what might be termed eras of roadbuilding since, but none that ever approached the era that was born with the inception of the motor vehicle. It no longer is a question of good roads, it is BEST roads and best roads means PERMANENT

When we wish to emphasize anything we usually look for its most highly organized example and point to that as what can be done. That is what the writer is about to do. Cuyahoga County, Ohio, of which Cleveland forms a large part, probably has more mileage of brick roads than any other area of the same size in the United States. California can boast of having the greatest mileage of concrete roads. These two types of highways—



Inspection party examining stretch of new brick road in vicinity of Cleveland, Ohio

brick and concrete—are the only types to which the qualifying adjective "permanent" may be applied without making it a misnomer. First let us look at the brick road in its broadest sense.

What Cuyahoga County, Ohio, has done may not be within the means of every county, but it serves to illustrate what can be done in trunkline road construction; in fact, what should be done.

A Study in Economics

Cuyahoga county, Ohio, may be said to furnish the best location in the world for the study of economic expenditure in the construction of county highways. A very large proportion of the mileage represented by these roads never has called for repair, and it is believed that the later and modern methods that are employed will eliminate almost entirely the maintenance and repair cost for an indefinite length of time. This county has had 20 years' experience with brick roads. The latest construction contracts call for monolithic work. This character of construction is now regarded as superior to any method that has been used in the past and greater attention also is being paid to drainage requirements.

The road system of Cuyahoga county has been given so much praise that anyone who claims connection with its development incurs danger of the charge of egotism, provided he omits to point out that the muchheralded excellence was a gradual growth and that costly mistakes marred the county's early ventures into this realm of improvement. These mistakes were due less to wrong theories or practices of engineers than to the demand of the taxpayers for a cheap improvement. This same spirit among those who pay for improvements is evidenced by the fact that petitions were made last fall for fifty-two additional brick roads in the county in which the abutting property owners agreed to pay from 20 to 25 per cent of the cost. Most of these brick roads have been built on a fifty-fifty

basis—half being paid by the property owners and the other half by the county.

Out of the early failures of materials were the present methods of construction evolved. There was no sudden vault to excellence. Errors were corrected and gradually a type of highway attained which won attention. No peculiarities of topography or soil make this kind of road more appropriate in Cuyahoga county than elsewhere. All conditions are found. In some parts the land is so level that drainage presents a problem. In others it is so broken that to secure a feasible grade without undue expense for excavation becomes the chief difficulty. The soil varies from sticky clay to sandy loam. The development of the brick road here, therefore, was obstructed by all the possible problems to be found elsewhere-natural and artificial soil, grades, climatic influences and lastly, but of great importance, the opinion of the abutting property owner.

The first brick road was started in Cuyahoga county in 1893 and was completed in 1895. The wearing surface was of standard size brick, 8 ft. in width, tar-filled, placed between stone curbs 3 by 15 in., and resting on a 6-in. broken stone base. This paving was placed on one side of the roadway with a graded earth drive occupying the balance of the width. No drainage was provided and really nothing of detail was taken into consideration.

The specifications, according to the county engineering department, were principally contained on the back of their cover. So far as the contract was concerned, it provided chiefly that the contractor was to be paid in any event. If anything could open the eyes of blind justice, surely it would be this first contract awarded in Cuyahoga county for brick pavement. No requirement in the specifications deal with the quality of stone and the result was that the contractor gathered up field stone for his base and they were of such consistency that when

the roller had done its work, one might think that sand ballast had been used. On this the cushion was placed without compression and then the brick. As to the filler no one could have told its composition at the end of six years, so little of it could be found.

The pavement being but 8 ft. in width, all of the traffic came in the same place. Lack of bond and absence of uniform support, caused depressions to appear. In the wet season these ruts or grooves filled with water which soaked the base, creating a worse condition from day to day. The colder weather brought upheavals and such havoc that many sections of the so-called improvement were a hindrance rather than an aid to traffic.

You may ask why these defects were not repaired. The law under which the improvements were made permitted no expenditure for maintenance. In 1898 the legislative flaw was remedied, but for 5 years there was no opportunity to palliate the badness of the methods employed and the continued dilapidation furnished a horrible example, the value of which was to hurt the brick road movement.

Since that time improvement in methods has given Cuyahoga county a steady growth in brick roads. Now no brick roads are constructed there that have not as their chief essentials:

Properly prepared sub-foundation. Smoothly-finished concrete base. Compressed sand cushion. Good brick.

Application of cement filler at the joints.

Traffic Controls Road Width

A satisfactory plan for the average rural pavement may include a paved portion anywhere from 9 to 16 ft. wide, the width being controlled by the amount of traffic to which the road is subjected. A dirt or gravel macadam grade should occupy the balance or unpaved portion of the width. Whatever dimensions are adopted, the surface drainage should be over the pavement toward the ditch on the side of the road closest to the pavement, eliminating the crown from the paved portion. The unpaved portion should be drained in the opposite direction. You may ask: "Why the dirt road?" The best answer is: "Ask the farmer," and he will tell you to ask the horse.

Several facts are found as the result of brick road experience in Cuyahoga county, to which contractors must adhere if the roads they construct are to give that measure of service to which those who pay for them have the right to expect.

Engineers will save themselves much trouble if they hold to such a grade line as will entail the minimum depths of fill. This is not always possible and it is the larger fills that call for the most extreme care. It behooves the engineer to see that his specifications contain a clause calling for the fill to be put in layers of not more than 6 in. thickness and each layer com-

pacted with a roller not exceeding 10 tons. This clause must be inforced with rigidity.

Puddling is the one method that may be followed successfully in the treatment of old fills. The surface of the road should be broken and the dirt removed from the center to the sides. At right angles to this trench, shorter trenches should be dug at intervals of 25 ft., forming a rectangular vat. Pump water into these compartments and allow it to stand until it has leaked its way into the fill. This will disclose weak spots and the engineer can take care of them as he thinks best.

The drainage from the graded portion of the road is of first importance. Whatever plan is adopted, the one that will most nearly maintain the sub-structure free from moisture below the frost line is the ideal condition to be sought. This means that you must not merely drain the road bed but adequate side ditches must be provided to carry off promptly the accumulated water.

However, there is no intention of making this an engineering treatise, but rather to show why this country needs permanent roads. We have lived in the mud long enough; we have the motive power which will mean dollars in our pockets if we put our highways in shape to give the advantage that automatically comes with roads that are equally well travelable in rainy as well as in dry weather.

Expression of the proven worth of Cuyahoga county's brick roads is admitted by Clevelanders to be too much for them. Their economy has proven in contrast with other methods of road building from the cheapest to the most expensive. The fact that these roads are in shape for maximum service twelve months in the year and that they originate no dust has endeared them to abutting property owners and to travelers from a distance. Washing by rain suffices to keep them clean and imparts a sanitary advantage which has been much emphasized by health authorities.



Road officials watching squeegeeing of last grout course of a new brick construction in Cuyahoga county

There has been a yearly increase in mileage until now there is approximately 300 miles and more is under contract. This does not include any but country roads. The cost of these brick roads with concrete base varies from \$849 to \$1,420 per foot in width per mile in length, exclusive of drainage and grading. The average cost in Cuyahoga county has been about \$1175 per foot in width, per mile in length.

The United States Department of Agriculture outlines the method of determining the approximate costs of brick paving and in a bulletin says:

The cost of brick pavement varies widely and is affected by so many influences that it is difficult to attempt to derive a general expression showing the relation between probable cost and local conditions. The price of brick, as also the prices of the various materials entering into the foundation, vary greatly according to the locality and freight rate. The cost and effi-

ciency of labor is far from being constant. Furthermore, the material composing the sub-grade and the method of preparing it may exert a marked influence on the cost of the pavement.

The grading usually is paid for by the cu. yd. and the cost, of course, varies with the character of the soil and the necessary amount of excavation. In light, easilyloosened soils, grading may usually be done at from 25 to 40 cents per cu. yd. In hard earth it may run as high as 75 cents, while in rock it may approximate \$1.50 per cu. yd. The cost of rough grading should be considered entirely apart from the cost of the pavement. In estimating the cost aside from grading, if C equals the cost of cement per barrel, S, the cost of sand per cu. yd., A, cost of coarse aggregate per cu. yd., B, the cost of paving bricks per thousand and 1, the cost of labor per hour, with all materials considered delivered on the work and all costs expressed in cents, then the probable cost of constructing a brick pavement, including the sub-grade, a 6-in. concrete foundation, and suitable curbs, may be estimated thus:

Cost per sq. yd. = L+C+S+A+B

The cost as estimated from this formula should be increased 10 per cent to allow for wear on tools and machinery and to guard against unforeseen contingencies. If it is desired to use a different thickness of foundation, it is safe to assume that each inch subtracted from the foundation will make a corresponding difference of from 8 to 12 cents per sq. yd.

The life of a well-constructed brick pavement cannot be estimated with any degree of exactness, first because of constantly changing traffic conditions and second, because no brick pavement which has been constructed in accordance with the best modern practice has yet worn out.

The brick must be in alignment to make the proper kind of pavement

NEXT WEEK
Cement Roads—Their Growth

Adopts New Motor Fuel

London Specifies "War Spirit" as Only Brand That Can Be Marketed

Casoline Concerns Have Pooled Supply for Distribution

L brands of gasoline being sold throughout England, the government has decided that only one brand is to be marketed, and it will be labeled "War Spirit." Heretofore some of the different brands of gasoline have been Pratt spirit (American), Shell spirit (Borneo) and various other brands. The new War Spirit represents the supply of fuel which has been pooled by the different gasoline concerns for distribution. Instead of gasoline being sold in green or red cans as formerly, it is to be marketed in khaki-colored tins.

The use of motor cars throughout the British Isles gradually is being restricted. One of the latest restrictions is a prohibition on renting or hiring of cars. Since the start of the war a big business has been done in hiring. Many private owners who have found it necessary to lay up their vehicles have hired cars from garages for trips through the country. Now no cars can be hired except under a special license, which is only issued to a certain class of people whose work comes under specified headings. The police have organized themselves and made many arrests for violations of this rule. At times as many as six barriers of this police nature are encountered in 100 miles. The private motorist is not complaining loudly over these restrictions as they know they are not imposed until absolutely necessary. The police treat all cases with the utmost consideration and courtesy, which helps the situation very much.

The tractor advocation has accomplished an amazing result, one which seemed impossible six months ago. England is going to plow three times as much land as ever before, and it is expected that when farmers once are started on this increased farming schedule that they will not drop back to their old time pace. As only a comparatively small percentage of farmers in England are car owners it is expected that this intensified farming will result in a greatly increased war market with agricultural classes. Unquestionably motor cars will sell to the farmers in greater quantities than ever before.

ARMY TRUCK BIDS

Washington, D. C., June 22—Eightyseven makers are represented in the bids for the first 35,000 army motor trucks requested by the War Department. That makers are ready to contract for many times the Government's present require-

ments is shown by the bids of three companies, Pierce-Arrow, Hurlburt and Nash, each offering to build the whole 35,000. Three concerns offered to build trucks at cost plus 10 per cent, and two offered to produce ten trucks a day for an indefinite period. Some makers are ready to deliver at once and others set varying delivery dates, ranging to six months. Quick delivery is expected to carry considerable weight in placing contracts. It is estimated that more than 40,000 motor trucks are on the entire western front in Europe. An order for 35,000 trucks by the American Government would result in putting the United States on a par.

FORD RUSHES AMBULANCES

Detroit, June 22—The contract for 2400 ambulances for the United States War Department involving \$1,500,000 and which was reported last week in Motor Age, is being rushed to completion by the Ford Motor Co. The order announced by Frank L. Klingensmith, vice-president of the company, is the first one given to Detroit makers.

MOTOR AMBULANCES IN KENTUCKY

Louisville, Ky., June 21—Motor ambulances for use in the United States army, it is reported, will be assembled at the plant of the Kentucky Wagon Mfg. Co. in this city. This is the arrangement that has been made by the quartermaster's department at Washington. The parts of the ambulances made by many factories will be shipped to Louisville for assembly. The contract made between the government and the Kentucky Wagon Co. specifies several thousand cars a year for several years and will require the employment of many expert mechanics in addition to those already connected with the company.

HARRY L. SHEPLER RESIGNS

Toledo, Ohio, June 22—Harry L. Shepler, vice-president in charge of production of the Willys-Overland Co., will resign July 1. Mr. Shepler's plans for the future are not yet ready for announcement. He has wanted to resign from the Willys-Overland Co. for several months owing to his desire for a complete rest. Harry L. Shepler has been associated with the industry since its inception and has been connected with the Willys-Overland Co. since 1909, first as superintendent, then as general superintendent, and finally vice-president in charge of production. He is one of the most important figures in the motor car industry.

W. H. Birchall, superintendent of the Willys-Overland Co. plants, has been appointed general superintendent to succeed Mr. Shepler.

MUSKEGON TO MAKE TRUCK

Grand Rapids, Mich., June 23—The manufacture of a line of trucks of 1 and 2-ton capacity, will be undertaken by the Muskegon Engine Co., Muskegon.

N.O.T. Boosters to Meet

Pueblo Gets Convention by Hard-Surfacing Road to Kansas Line

Judge J. M. Lowe, Father of Association, Resigns

ANSAS CITY, Mo., June 23—The annual convention of the National Old Trails Road Association will be held in Pueblo, Colo., Aug. 16-17, 1917. Pueblo gained the convention by steps to hard-surface the National Old Trails Road from Pueblo to the Kansas line. Proceedings are now under way for the hard-surfacing of the road across Kansas, with the exception of two or three counties and petitions probably will be started in these counties this summer. The chief business of the convention will be the election of a president to succeed Judge J. M. Lowe, who has resigned.

Judge Lowe has been the godfather, father, nurse and sponser of the National Old Trails Road Association. It was organized April 17, 1912, and he was elected president. He has served ever since. The purpose of the organization was declared to be the permanent construction of a transcontinental highway from Washington, D. C., to Los Angeles, Cal., but there was not a cent in the treasury to prosecute this purpose, there was not a mile of road built and maintained in such a manner as to be recognized as a good road.

During the last five years the highway has received an average of \$5,516.41 annually and has to show as results more than \$10,000,000 expended in the permanent construction of the road. The highway is practically complete from Baltimore and Washington through Maryland, Pennsylvania, West Virginia, Ohio and Indiana, and in Illinois its building is assured by a recent road bill. In Missouri the legislature permitted the suggestion of adoption of the Maryland statute requiring the state to pay half the cost and the county through which it runs, half. In Kansas the constitution prevents the state from contributing to any internal improvement, but the people are actively urging county and district bond measures. California has built nearly half the road, and the balance is provided for in state bonds already issued. Arizona, New Mexico and Colorado will finish their part within 1918.

ANOTHER FLYING FIELD

Washington, D. C., June 25—The Signal Corps announces the letting of the contract for the fourth of the new Government flying fields, to be built at Belleville, Ill., 23 miles from East St. Louis. It will be a standard two squadron field, accommodating 300 student flyers, with the requisite number of officer instructors, me-

chanics and enlisted men, and providing hangars for seventy-two training planes. Construction of the buildings and the preparation of the field will begin immediately.

The location of the fields already announced are Dayton, Ohio; Mount Clemens, near Detroit, and Rantoul, near Champaign, Ill. The Government's present plans contemplate the fifth contract in about two weeks, and the remaining four of the nine fields already authorized at successive intervals of the two weeks thereafter.

The preparation of the three fields already started has been made an emergency job, and the Chanute Field, at Champaign, Ill., is already nearly done. The contract for Chanute Field was let May 24, and work began May 27. Substantial progress has also been made on the big four-squadron Wilbur Wright field at Dayton and the Seldridge Field at Mount Clemens. The authorities hope to have men flying on all three of these fields by the middle of the summer.

DISBROW ADDS A SPECIAL

Cleveland, June 23—The "Quad Express" was chosen by Louis Disbrow for the new addition to the line of Disbrow Specials. It is a four-passenger car, while its speed ranges up to 87 m.p.h., which is responsible for the "express" part of the name. The present Disbrow models are all two-seaters, with the bucket style of arrangement. A novelty about the quad express will be the painting of the radiator shell the same color as the wheels. Notwithstanding the two extra seats, the new creation will possess the same racy appearance as the present line of two-passenger semi-racing sport Disbrow cars.

COMMONWEALTH TRUCK SERVICE

Chicago, June 25—The Commonwealth Edison Co., of Chicago, has come to the rescue of the electric vehicle owner with a plan to give complete garage and maintenance service for commercial electric vehicles at specific rates per annum on long term contracts. The proposed service will cover ordinary storage, including the cleaning and care of vehicles, besides charging the battery and maintaining the wearing parts, such as tires, batter and mechanical parts.

The maintenance will cover minor repairs of all kinds as well as the renewal of tires and battery when worn out. The body will be painted at specified intervals, and retouching and varnishing will be done. New trucks only will be accepted for the service. The rate will be a flat figure per annum, payable monthly. Trucks equipped with batteries larger than the standard will be charged for at proportionately higher rates. The working radius of the truck the flat rate is to cover is that amount of service obtainable from one charge of the battery daily. Additional charging will affect the flat rate.

Organize New Drexel

Assets of Old to Be Purchased and Production to Be Continued

Will Use Ferro Eight Engine Instead of Sixteen Valve

HICAGO, June 26—Affairs of the Drexel Motor Car Corp., implicated by the failure of two South Side Chicago banks and which seemed about to be smoothed out, reached a state of chaos in a stockholders' meeting held last Sunday, with the result that a new company is to be formed to take over the Drexel that will have an entire new official personnel and will bring out a new car equipped with an eight-cylinder Ferro engine instead of the sixteen-valve engine formerly used. The new car will sell at a price around \$1,295.

Two weeks ago Judge Carpenter in the Federal Court appointed a receiver for the Drexel Motor Car Corp. at the request of certain stockholders. In the meeting held last Sunday a new managing committee was appointed which will organize a new company to be incorporated under the laws of Illinois for \$300,000, all of this stock to be absorbed by the present Drexel stockholders. This company will buy the assets of the old Drexel and continue operation. By forming a new corporation a large amount of stock which it is said brought little if any revenue to the old company will be eliminated. There will be no stock which does not represent actual physical assets of the new concern.

Tests have been made with the Drexel car equipped with an eight-cylinder Ferro engine for several weeks, and the new company will go ahead with the Drexel production using the Ferro engine, according to members of the committee now organizing the new company.

A. J. Farmer, former president of the company, and officials of the two defunct banks who held large blocks of stock in the Drexel Motor Car Corp., will have no connection with the new concern. Plans are under way for utilizing at least part of the factory for the manufacture of munition. According to the committee's report last Sunday, \$350,000 was received from the sale of stock in the Drexel, \$213,045 in materials and debts of \$106,070, leaving an equity of \$106,974 for the holders of \$1,300,000 par value of stock.

WAGNER-HOYT FAILS

New York, June 25—The Wagner-Hoyt Electric Co., organized in June, 1916, has gone into bankruptcy. All its merchandise, fixtures and machinery will be sold at public auction at the factory and salesroom, 1902 Broadway, July 2, under the supervision of the Supreme Court of New York.

The company was organized to manufacture complete electrical equipment for motor cars and market it as a unit. A. F. Wagner, formerly president of the Wagner Specialties Co., and Frank Hoyt, formerly chief engineer of the Simms Magneto Co., together with Gerald Laugh, formerly connected with the Burroughs Adding Machine companies, were the incorporators. Mr. Wagner was president and general manager, Mr. Hoyt treasurer and chief engineer and Mr. Laugh secretary. The concern obtained a license under the patents of the late H. Ward Leonard covering the control of electric lighting systems on motor cars and in addition to producing the complete electrical equipment of a car, including starting and lighting, ignition and lamps, also marketed a new type of storage battery.

STUTZ ELECTS OFFICERS

New York, June 23—At the organization meeting of the board of directors of the Stutz Motor Car Co., officers for the ensuing year were re-elected with the substitution of W. N. Thompson as treasurer, who takes the place of G. H. Saylor, resigned. An executive committee was selected, composed of Harry C. Stutz, Allan A. Ryan and Sherburne Prescott. At the annual meeting of the stockholders, W. N. Thompson of Indianapolis and John J. Watson, Jr., of this city were elected directors,

Net profits of the Stutz company for the first 6 months of this year, with the latter half of June estimated, approximates \$600,000, equal to \$8 a share on the 75,000 shares of stock outstanding. This total of approximately \$600,000 net profits in the first half of this year compares with \$649,042 net profits for the entire calendar year 1916.

ATLAS WINS HOBBS SUIT

Chicago, June 23—The Atlas Specialty Mfg. Co. has won the suit brought against it by the Hobbs Patent Co. in the District Court of the United States for the Northern District of Illniois, Eastern Division, Nov. 22, 1915, for infringing on its patent No. 901,616, covering radiator and hood covers. Judge Carpenter on Oct. 23, 1916, decreed the Hobbs patent void for want of patentable novelty. This decision was appealed only to be sustained. The Hobbs company then filed a brief for rehearing with the result that the Court of Appeals' decision was affirmed and the suit settled in favor of the Atlas company.

DENEEN ANNOUNCES NEW MODELS

Cleveland, Ohio, June 22—The Deneen Motor Co., maker of the Denmo truck, announces the following models: Three-quarter ton, model 12, three different types of bodies, \$995, \$1,020 and \$1,065; 1½-ton, model 10 chassis, \$1,490; 2-ton, model 15 chassis, \$1,790, and a 3-ton, model 14, at \$2,325.



EDITORIAL PERSPECTIVES



Airplane Status

WITH \$600,000,000 practically agreed upon for airplane manufacture for the war; with six of our colleges at present conducting classes on instruction of aviators; and with many large aviation fields in the process of construction, it is conclusive that the airplane has passed the stage of temporary interest and has become an accepted permanent means of transportation. Today the airplane is a vehicle of war, but tomorrow it will be a vehicle of transportation in pursuits of peace. The tens of thousands of airplanes in use in the war will not be laid aside when peace is signed. The great airplane industry that is being built up in almost magical strides will not subside with the signing of peace. The airplane has demonstrated that in the war it is as safe if not a safer vehicle of transportation than the motor car for practically all speeds.

E UROPE already is wrestling with the problem of what to do with her thousands of army planes when the war is over. Mail routes already have been planned. It is possible to have rapid personal transport over distances of 1,000 miles where speed is a great requisite and cost a secondary consideration. There is a possibility for a great parcel transportation system, particularly for conveying documents which call for the greatest possible speed of delivery.

It is not at all impossible that aerial service may fill a position compared with railroad transportation that the telegraph fills today compared with the mail system. Speed in the transmission of mails by airplane may be as essential as the long distance telephone between San Francisco and New York or the cable be-

tween New York and London or Paris. The airplane unquestionably brings a new era of speed into this field. With some battleplanes capable of maintaining 125 m.p.h. and capable of doing night service, of flying irrespective of the weather, it will be possible to give quick mail service or parcel delivery among the many cities in the country.

THESE are days of great changes. These are days when revolutions, not only political but economical, are taking place. These are days when we are living so close to epoch-making events that we do not get the perspective and fail to grasp the magnitude of the changes as those who live fifty years later will. The airplane is essentially the development of the present war, and since it has demonstrated its speed, its dependability and its all-weather ability, it cannot but take a permanent place in transportation systems.

It is not impossible to foresee the time when multi-millionaires, instead of hiring special trains to rush from one side of the continent to another, will make the trip by airplane. To them speed will be essential and cost secondary. It is possible to foresee the time when eminent surgeons may be called upon to make airplane trips from New York to Chicago or from Denver to San Francisco to save life. It is possible to see the time when in case of serious land accidents in inaccessible sections medical aid may be furnished by airplane. There are multitudinous fields demanding more rapid transportation than afforded by the railroad train which averages 56 m.p.h. as compared with the airplane which may average 125 m.p.h. for limited distances.

Who Pays the Mud Tax?

THE average cost of hauling farm products over our roads as a whole at the present time is 23 cents per ton per mile. Take such an agricultural state as Kansas, where there is much hauling of wheat and other farm produce. Here the average weight per load last year was 2960 lbs., the average haul 5.5 miles, 4½ hrs. being required for a round trip. The cost for a team, wagon and driver for a 10-hr. day was \$3.50, making the ton-mile cost 21.5 cents. Think what permanent hard roads would mean to a state like Kansas—to any state. The tone-mile cost by rail is % cent; by water, ¼ cent. Over our average roads the cost of moving 1 ton 1 mile is from twenty-five to fifty times as much as by rail and from 100 to 200 per cent greater than by water.

ROAD draft is figured on the basis of the number of pounds required to pull a ton on the level. The horse, perhaps, is the best basis for working out what the relative difference is as between a poor, sandy road and one that has a permanently-hard surface. A horse exerts a pull in pounds that equals about one-tenth of its weight at walking speed. It can exert a pull of one-half its weight for short distances, but one-fourth is the ordinary maximum for longer periods. Assuming that a vehicle weighs 1500 lbs. and the load 3000 lbs., we have 2¼ tons. The pulling energy in pounds that the team would have to exert per ton would be as follows

over the classes of roads given: Loose sand, 280 to 350; gravel with ¾-in. loose top, 300; dry gravel, 258; best gravel, 60 to 100, dirt, 75 to 150; hard dirt, 106; macadam, 40 to 60; asphalt, 30 to 60.

HE drawbar pull of a motor truck is affected by certain conditions such as gearing, speed of the engine, fuel combustion, etc., that are not comparable to that of a team. However, the greatly increased power to pull attained by a motor truck as compared with a team is common knowledge to anyone, so it will follow that the limits of pulling power over different classes of roads would bear the same relation according to the motor vehicle's ability to pull as it would to the team. We have in this country something like 2,500,000 miles of country roads of all classes, BUT ONLY 11 PER CENT OF THEM ARE SUR-FACED. Can you imagine what an enormous mud tax we pay annually. Some statisticians put it at \$300,000,000 a year. It is a figure that calls for a great amount of study to be accurate, but we do not have to figure much to realize that if dirt or sandy road ton-mile costs are from 20 to 50 cents and the tractive resistance of these roads bears the relation of 350 lbs. to 30 for smooth, hard roads, we are paying an enormous toll as a penalty for our laxity in building the type of roads that have made history in Italy and France; or such patches of roads that have been permanently improved in this country.

Why We Are at War

A MERICA is not fighting merely for an ideal; America is fighting for something that is extremely real, that is vital to us. We do not wish to go back to the day when one man can impose his will upon a hundred million men. We wish our country to continue its life upon the basis of common consent and not upon imposed power. We are fighting for the right to live, for the man who works with his hands, in the mine or on the farm, or in the factory, or in the office. He is the man who makes modern civilization."—Franklin K. Lane, Secretary of Interior.

QUITE frequently we hear the question put: "Why are we fighting Germany?" Almost as frequently we hear queries as to how democracy is in peril, why the fathers and mothers of this country should send their boys to France to fight for democracy and why we should spend billions of dollars in a fight for the abstraction—democracy. Undoubtedly it is because too few of us realize what real democracy means. Honorable Franklin K. Lane, Secretary of Interior, defined our reasons for being at war to the Editorial Conference of Business Papers recently at Washington, D. C. After putting democracy in the category ahead of our resources and the genius of our people that has solved the difficulties of 150 years of life, he said in part:

has the mind that can grasp figures such as this war involves—a war with 40,000,000 in arms, a war in which 15,000,000 have passed over the Great Beyond, a war in which it has been necessary to mobilize every resource of every country on the face of the globe. Nothing comparable with it has ever been dreamed of by man; we are a part of it now, and why are we a part? I find that people have short memories; that we are a kindly and a sympathetic people who permot maintain in ourselves a consciousness of bitterness for any length of time.

E are fighting Germany because Germany insisted that we should fight them, she violated all our rights, she attacked us, and we saw, as time went on that there would be no freedom for us, that Bunker Hill and Lexington and all the proud names of the past would be idle, valueless, unless we were willing to assert our duty; unless we were willing to let our sympathies take concrete shape and support the principles in which we believe, so that there might be freedom upon the land, and upon the shore as well.

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Germany showed to what extent she would go. Belgium and the Sussex—so why bring them up? Those who talk in that way simply fail to realize that the philosophy, the purpose, the determination of Germany could not be realized by the world until Germany showed to what extent she would go. Belgium and the Lusitania and the Sussex are but bits of evidence which, put together, bring forcibly to mind this one thing: That government by the soldier is not consistent with government by the people.

GRMANY is a great power; the Germans are a wonderful people; but Germany has a will to rule that is inconsistent with our determination that government by the people shall live. Germany is a combination of two things-of a survival and of an invention. She is a combination in her government of the feudalism of the thirteenth century combined with the inventive genius, the organization and the methods of the Nineteenth Century. Feudalism plus science is what she represents, and feudalism plus science is fighting today against democracy plus science, and we must determine which shall be dominant on the face of the earth, because they are irreconcilables-just as irreconcilable as was slavery in the South, and freedom in the North. We must realize the system which Germany represents is one that makes for the aggressive conquest of the world. Just as surely as was the system that Mahomet tried to carry out centuries ago, and Mahomet tried to carry out his system by methods that were as far from the civilized systems of his day as are the methods that Germany has attempted to the methods of our day—the dropping of bombs on harmless civilians, the submarines striking in the dark at harmless women and children, the scattering of all kinds of evils, in the name of war. The very fiend of war himself would not stand for those things that have been done in his name in the last two

How Old Dobbin Aids

Gives His Very Hide to Help Make Rubber Tires for Motor Cars

Wild Mustangs of Bolivian Plains Assist Most

WE CALL these horseless days and jeer Old Dobbin when we speed by him on the highways, but we still owe him a word of thanks. He plays an important part in tire manufacture and we, gliding smoothly over the highways on our cushion-like casings should be appreciative, albeit, Dobbin's aid is unconscious and probably involuntary. The illustration, taken in the office of the crude rubber expert of the B. F. Goodrich Co., shows how Old Dobbin plays his part. It pictures what the South American calls a seroon, and it is made of Dobbin's hide and used for the transportation of the crude rubber through the jungles of Bolivia.

Bolivian plains are inhabited by immense herds of wild mustangs. The natives, in the rubber fields, seeking containers for their product and being without baskets, boxes, or tools for their manufacture, seize their bows and arrows and persuade the wild Dobbins that rubber transportation is more important than horse life. They kill the wild mustangs and cut the hides into sections which are formed into basket shapes and fastened by thongs of mustang skin.

Occasionally a seroon, filled with rubber, finds its way to Akron, and it was such an event that brought the one illustrated to the Goodrich offices, where it was photographed.

SANFORD TRUCK REORGANIZES

Syracuse, N. Y., June 23-The Sanford Motor Truck Co. has been reorganized and active control placed in the hands of E. A. Kingsbury, E. A. Dauer and J. E. Gramlich, all previously connected with the Chase Motor Truck Co. The company will market an entirely new line of trucks including 1- and 2-ton internal gear drive and 21/2-, 31/2- and 5-ton worm-drive models. The officers of the new Sanford company are: President, J. F. Durston; vicepresident, C. Hamilton Sanford; secretarytreasurer, F. F. Sanford; general manager, E. A. Kingsbury; general sales manager, E. A. Dauer; chief engineer and designer, J. E. Gramlich; assistant engineer, W. F. Hinnelsbach.

SUMMER SALON AT MILWAUKEE

Milwaukee, Wis., June 23—The Milwaukee Automobile Dealers, Inc., embracing practically every distributer and retailer of motor cars in Milwaukee, has arranged for a Summer Salon showing of cars in the garages and salesrooms of the respective

members, June 28-30, to stimulate business. The exhibition will be conducted along the lines of the successful shows of this type already held in Los Angeles and Omaha, but is based on the original idea of the M. A. D. of a "garage-circuit" motor show, introduced three years ago during the latter part of April. This year the M. A. D. dispensed with the spring salon, the Used Car Congress at the Auditorium April 19-25 taking its place. N. E. Osmond, Chalmers distributer, has been appointed chairman of the show committee and will be assisted by Walter H. Diener, Haynes and Grant; Herbert W. Bonnell, Mitchell; George W. Browne, Overland and Willys, and Frank J. Edwards, Kissel and Dodge.

NEW DETROIT ELECTRIC

Detroit, June 20—A new Detroit electric is being produced by the Anderson Electric Co. It has a Springfield type body, side steering lever, or steering wheel, if desired, at an additional cost of \$30, body in cobalt blue; wheel, optional color, Goodrich Silvertown tires, 33 by 4½, Detroit battery, 42-cell, 13-plate, 25 m.p.h. maximum speed, mileage capacity 65 to 100 miles, depending on road conditions, price, \$1,975.

JEFFERSON OFFICIALS RETURNING

St. Paul, Minn., June 22—After a stop in the Twin Cities for the semi-annual meeting at the Hotel St. Paul, the Jefferson Highway Association official party returning from a round trip to New Orleans left at 8:30 a. m. Monday for the last leg of the trip, to arrive in Winnipeg June 29. Paul Nesbitt, speaker of the Oklahoma house, was elected to the directorate to succeed R. W. Dick, who has removed from the route. The resignation of H. H. Polk, of Iowa, was accepted and his place will be filled by Iowa nomination.

Parks Await Motorists

New Lassen Volcanic Playground Puts on Active Eruption

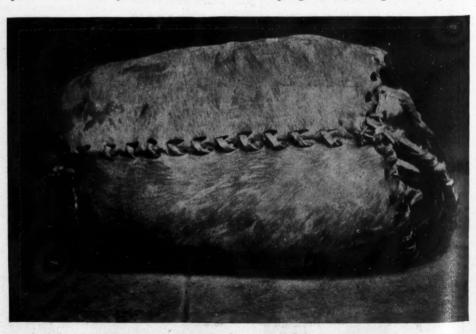
Maps of Roads Make Car Travel Easy for Tourist

WASHINGTON, D. C., June 22—The National Park Service now has ready new motor maps in two colors of the Glacier, Rocky Mountain, Crater Lake, Sequoia, and Mount Rainer National Parks. They are similar in design and purpose to the maps issued last year of the Yosemite and Yellowstone National Parks and distinguish between good and poor roads and show all trails. Distances are indicated and many places pointed out where gasoline and water may be obtained. Other information useful not only to motorists but general tourists is given. These maps may be obtained in each national park or upon application to the Department of the Interior.

At Once Active

Many persons who desire to see volcanic phenomena will visit the new Lassen Volcanic National Park this season. A month after Congress made it a national park last summer the volcano broke into eruption and the region is still actively disturbed.

Lassen Peak is in northern California. It is one of the celebrated peaks of the Cascade range, which include Mount Baber, Mount Hood, Mount Shaska and what was once Mount Mazama but is now Crater Lake. Few of the ice-plated volcanos of this range are extinct in a geological sense of the word; several of them have areas on their sides where snow melts, or have hot springs in their neighborhoods; Las-



Seroon, or horsehide bag, that transports crude rubber

sen Peak is the only one actually active within history.

Notwithstand the war, a larger patronage of the Rocky Mountain National Park is expected this year even than last, when 86,000 visited it and its beautiful valley gateway, Estes Park. The hotels, boarding houses and public camps which then were crowded have all been enlarged. Even with an increase of many times of patronage, there will be no sense of crowding in the park's 400 square miles of valleys and mountains.

During the winter Congress has enlarged the boundaries of the Rocky Mountain National Park by adding more than 40 square miles of area upon the Estes Park side. The Twin Sides and Gem Lake are now in the national park.

PEOPLE TO DECIDE ROADS

Springfield, Ill., June 23—Governor Frank O. Lowden today signed the Meents \$60,000,000 good roads bill submitting the bond issue to the voters. The new law provides a comprehensive system of hard roads, aggregating 4500 miles, that will be built within the next four years if the voters approve it. The system, which has been described in Motor Age, reaches practically every one of the 102 county seats of Illinois, connecting them with the more important cities.

The companion bill, which is to pay for the issue, doubling motor vehicle licenses, was signed last week. The principal of the \$60,000,000 will be paid from the license fees. The expectation is that the entire issue will be retired within twenty years.

TO SHOW FORD ACCESSORIES

Chicago, June 22—At a meeting held this week plans were laid for financing the national exposition of Ford accessories, a body of manufacturers that will direct shows throughout the country at which will be exhibited accessories made especially for Ford cars.

H. V. Buelow, Toledo, Ohio, has been made show manager and will have charge of all of the shows, the first of which will be held in Chicago in September, and others in the principal cities of the country on dates not yet determined.

Included in the personnel of officers and directors are men representing companies of national importance, which marks the proposed show as one of more than local importance. It has been found that there are some 300 manufacturers who, it is hoped, will become members of the organization, the membership fee being \$100. This is not an annual fee but, once paid, makes the membership permanent.

An office has been opened by Mr. Buelow in the New Southern Hotel, Chicago, from which details of the show will be worked out. It is proposed that a circular be published and that each member send out his pro rata of a total of 300,000 to Ford owners within a radius of 300 miles of Chicago.

To Dismantle Speedway

July 4 Races at Omaha to Be Last for Present Board Track

Nineteen Drivers Enter for 150- and 50-Mile Events

OMAHA, Neb., June 25—The Omaha speedway, considered one of the fastest board tracks in the country, is to be dismantled after the races here July 4. It was built about three years ago at a cost approximating \$125,000.

Nineteen drivers have been entered for the race, which is an A. A. A. championship award event. Two races, of 150 and of 50 miles respectively will be held, as was the case last year. With the faster machines which are being brought out this year and with the smoothing out of "shoulders" in the track which has been in progress, it is confidently expected that new records for both distances will again be made at Omaha this year, as was the case in the 50-mile event last year. The drivers are arriving and tryouts already have developed speed well above 100 m.p.h.

FOUR AT UNIONTOWN JULY 4

Uniontown, Pa., June 22—Winners of the two big speedway races this summer at Cincinnati and Chicago, Louis Chevrolet and Earl Cooper, respectively, together with Ira Vail and Louis Fountaine, Ralph de Palma's former mechanician, have been matched for a four-cornered race at the Uniontown speedway July 4. The four drivers signed contracts at Chicago for their appearance here to compete for the \$5,000 purse.

Chevrolet was the winner of the first race for the University trophy last November, driving a non-stop race as he did in winning the Cincinnati Sweepstakes on Memorial day. Earl Cooper drove a non-stop race at Chicago last week. In addition the Uniontown program consists of a 112-mile dealers' race and a four-cornered Australian pursuit race among the four fastest cars in that event. De Lloyd Thompson, the aviator, has been engaged to make several flights during the progress of the races.

STOCK CARS TO RACE

Denver, Colo., June 22—A 131-mile road race from Denver, Colo., to Laramie, Wyo., for stock cars only, will be a part of the Fourth of July program here. While special racing machines will be barred, entries will be open to all makes and classes of stock cars, and a big field is expected. The course is a dirt road, with gravel surfacing about half the distance. It skirts the mountains practically all the way, and one stretch near the finish runs through a

canyon in the foothills. Sharp curves and a few rather steep grades call for heady driving and make the course more attractive in respect to thrills promised.

About a dozen towns are directly on the route, and all these and several others nearby offer to help make the race a success. Dragging and other road work will be given special attention by county commissioners and other officials responsible for upkeep, and a good condition of the entire course is looked for.

The race will be conducted by the Denver Times, which will have the co-operation of the Denver Motor Club and the Automobile Trades Association of Colorado.

OKLAHOMA RACES OPEN

Oklahoma City, Okla., June 22—The feature opening race was the 10-mile freefor-all, for which \$300 was offered, to the three winners. Fred Horey, driving a Briscoe, finished first in the first of the midsummer motor races here. Less than a car's length behind was Sig Hugdahl, driving a Maxwell. Art Klein, driving a Briscoe, finished third.

In the second day's races, Art Klein in a Briscoe, won the stellar honors by out-distancing Craft, Hugdahl and Horey, in the 25-mile free-for-all, for a purse of \$500. He drove the distance in 33 min. 16% sec.

BARNEY SETS NEW MARK

Milwaukee, Wis., June 25-Barney Oldfield, driving his new Miller "Golden Egg" racer, defeated Ralph de Palma in a special match race run in three heats of 10, 15 and 25 miles, on the one-mile circular dirt track at State Fair Park, near Milwaukee, on Sunday afternoon. More than 8000 people turned out to see the match. It originally was scheduled for Saturday afternoon, but was postponed because of the near-cloudburst of Friday night, when 5.85 in. of rain fell, a new record in Milwaukee weather bureau records. Because of the excellent drainage system, the track was in fair shape by Sunday afternoon, but nevertheless was rather heavy. Oldfield started off the program with an exhibition mile against time in the Miller, being caught at 52% sec. De Palma then drove 2 miles in his Packard special, his time being announced as 1:45%. Oldfield won the first match event, at 15 miles, in 13:25, it was announced. The second heat, at 25 miles, also was won by Barney in 22:42. The last heat, a 10-mile event, went to Oldfield in 9:02%. Fred J. Wagner handled the events as starter.

ROCKWELL HEADS SMITH SALES

Chicago, June 26—Berry Rockwell, formerly with the McAvoy Advertising Agency, in Chicago, has been made general sales manager of the Smith Motor Truck Corp. and has already assumed his new duties.

Standardize to Increase Food

Industry to Make Agricultural Tractors More Simple to Assure Adequate Supply

WASHINGTON, D. C., June 25—Special telegram—Entry of the United States into the world war and the knowledge that the airplane certainly will be one of the deciding factors if not the deciding factor in the success of America and its Allies, makes the standardization of the variout parts of the aerial warships, a long step toward which was taken to-day, of particular significance. This was accomplished at the annual midsummer meeting of the Society of Automotive Engineers, at the Bureau of Standards.

No less important from a national standpoint, and, perhaps of even greater importance to the general public, was the work accomplished toward the assurance of adequate food supplies in the work done in the way of making the production of agricultural tractors more simple and rapid and also the assistance that was given the farmers of the country in selecting the proper tractor for their individual needs. To these ends were gathered the designers, engineers, production men and the important forces of the manufacturers of motor cars, trucks, tractors, airplanes and motor boats in Washington under the auspices of the Government and in quarters at the Bureau of Standards assigned them by the Federal Government. That the heads of the nation recognize the value of the work being accomplished by the motor car men and those of the allied industries in the truck, tractor, airplane and motor boat fields was emphasized in an impromptu address of welcome by Secretary Redfield of the Department of Commerce, who spoke very highly of the importance of the work that the Society of Automotive Engineers was doing in solving the manufacturing problems and in assisting in Government war work, both as a society and as individuals.

Standards to Be Considered

The meeting to-day was that of the standards committee of the society and the reports of the divisions of this committee which were accepted to-day will be presented to the society as a whole to-morrow. It is anticipated that the standards which have been accepted by the standards committee will be accepted by the society, after which they will become standards of the industry upon acceptance by a mail vote of the membership.

More than 300 attended the meeting of the standards committee to-day, and 700 are expected at the general meetings tomorrow and the dinner in the evening. Tomorrow will see the routine business of the society in the way of officers' reports, committee reports, etc.

The report of the membership committee is expected to be of particular interest, as it is believed it will show an increase in membership of between 800 and 1000 during the last two months. Among the features of to-morrow's sessions are the following formal papers:

"Building Submarine Chasers by Standardized Methods," by Henry R. Sutphin, illustrated by motion pictures.

"The Farm Tractor as Related to the Food Problem," by H. L. Horning, illustrated by motion pictures.

"Design and Production of Aircraft in War Time," by Wing Commander I. W. Seddon, of the British commission.

"Classes and Uses of Battle Planes," by Lieut. Amaury De La Grange, of the French commission.

"Fundamentals of a Successful Kerosene-burning Tractor Engine," by C. E. Sargent.

"Lessons of the War in Truck Design," by W. O. Thomas.

At an informal dinner at the new Willard Hotel, the engineers are to be addressed by Secretary of War Baker and others close to the great national war movements.

One of the most important matters today was the proposal to standardize quite extensively with relation to farm tractors. The proposed standards are entirely fundamental in character.

"They are points," said H. L. Horning, chief engineer and general manager of the Waukesha Motor Co. and member of advisory committee, in the Council of National Defense, "which have been bothering tractor manufacturers for years. If adopted they undoubtedly will determine the future policy of the farm tractor industry."

The tractor standards committee recommends, first, that the rating of tractors be standardized, that there be two ratings, one the drawbar horsepower and the other the belt horsepower. The drawbar rating would be based upon 80 per cent of the actual ability of the tractor operating on good, level footing for 2 hrs. continuously. The belt rating would be 80 per cent of the power which the engine is guaranteed to develop continuously for 2 hrs. In determining these ratings, the committee took into consideration the likelihood of farmers operating tractors up to the limit of their ratings; so that if this limit be

set at only 80 per cent of the ability of the tractor there will be little danger of disastrous overloading.

Another matter that was considered was the proneness of farmers to judge the capability of a tractor by the number of plows it will pull regardless of the speed at which they are pulled. For this reason it is proposed also to standardize tractor speeds at 2½ m.p.h. This speed has been determined to be the best from the plowing point of view from long experimentation. Slower speed prevents proper scouring of the plows and higher speed is scarcely feasible. Furthermore, this speed is exactly suited to existing types of mold-board plows and will not require new designs.

The belt speed also is to be standardized. It has been recommended that belt speed be made to conform to the requirements of the threshing machine. It is to drive these machines that belt power is most extensively used. It has been found that a belt speed of 2600 ft. per minute is best, and this speed is recommended. This can be obtained with a 42-in. pulley running at 240 r.p.m. Two other important tractor matters which it is recommended be standardized are the height of the drawbar from the ground and the method of attaching various farm implements to the tractor. The drawbar height recommended is 17 in. A standard type of coupling would permit the use of any make of farm implement with any tractor, thus simplifying the handling of farm implements from the dealers' point of view as well as from the

Present Standards Apply

Many existing S. A. E. standards covering such things as nuts and bolts, yoke and rod ends, cotter pins, screw threads, etc., already are applicable to the farm tractor, and other standards, such as those covering magneto mountings and carbureter flanges will be modified in the degrees necessary to fit them to tractors. This means that the motor car or truck dealer eventually will be able to supply the demands of the farm tractor owner from the motor car stocks on his shelves.

The committee is considering the standardization of drive wheel rim punchings. This would permit the interchangeability of various types of lugs used for getting traction in different soils. Thus the scope of the tractor would be increased because it would be possible to use it for different operations with very little change, and that change easily made.

Of equal importance with these tractor standards are the proposals made by the aeronautic division. Here, too, there are many motor car and truck standards which can be adopted without change and this is being done. To-day the committee took up in detail the method of control and recommends that the control be the same for all types and makes of machines. This will simplify the training of aviators in addition to overcoming many manufacturing problems and reducing the stock of spare parts which a dealer must have. Through the labors of this committee production difficulties will be swept away and airplane manufacturers will be assisted in obtaining the quantity production which is vital at the present time.

At the meeting of the standards committee in Cleveland, the electrical equipment division made certain recommendations concerning the size and shape of generator and starting motor flanges and these have now been formally approved by the standards committee. The adoption of these standards will reduce the spare parts stock of the dealer, garageman and supplyman in addition to simplifying maintenance work. Two sizes of both flanges are proposed for every type of generator and starting motor.

May Standardize Voltage

The lighting division, which is closely allied to the electrical equipment division, recommends that a method of headlamp construction be adopted which will do away with all need of focusing; in other words, lamps would leave the factory properly focused, could never get out of focus and hence would never need attention of this kind. The adoption of this standard will reduce the amount of service the dealer must now give in focusing lamps for car owners.

This division also recommends that battery manufacturers standardize the voltages of their batteries as follows: 3-cell, 6-8 volts; 4-cell, 8-10 volts; 6-cell, 12-16 volts, and 9-cell, 18-24 volts. Such action would assist the bulb manufacturers in turning out bulbs of the highest possible efficiency for the voltage. This would also tend to reduce the number of lamp sizes the dealer must stock.

The starting battery division, also allied to the electrical equipment division, actively engaged in a campaign to get manufacturers, among other things, to eliminate all loose parts about a battery—parts which can be lost in the service station or garage. These are principally the terminals. Two sizes, one for the negative and the other for the positive post, are recommended. They are different in size so the garageman cannot possibly through error or carelessness get the wires twisted.

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The dimensions of the batteries themselves having been previously standardized, this committee now recommends that a standard size of battery compartment be

adopted. This would be both ventilated and drained. It has not been decided just where this would be located, however.

Another very important matter which the engine division recommends is the adoption of standard sizes for all poppet valves. At present there is an immense number of sizes varying only by fractions of an inch. In consequence, and except in exceptionally few cases, the valves for one engine will not fit any other engine of the same dimensions. If the recommendations of the committee are adopted, there will be just sixteen sizes of valves for every type of engine-farm truck, tractor and motor boat. The largest is 1-in. and from that the sizes increase in diameter by 1/8-in. increments. Furthermore, this standard valve will have a standard slot in it for the valve grinding tool, thus simplifying again the work of the garageman and re-

The miscellaneous division, which has the work of standardizing a lot of small parts, has extended the standards covering rod and yoke ends to include two larger sizes, namely, %-in. and %-in. These conform closely to present standards on smaller sizes.

Army-Type Truck Jan. 1

New Standards to Make All Parts Interchangeable and Benefit the Small Maker

WASHINGTON, D. C., June 26—Special telegram-Through a conference of officials of the War Department, makers of truck parts and the Standards Committee of the S. A. E. specifications for military motor trucks will be far more accurate and detailed than the original draft published recently. By Jan. 1 there will be coming from factories for the Army trucks whose units will be interchangeable with those of all other American Army trucks. Engines, transmissions, axles, springs, radiators and even frames will be so closely similar in external dimensions that one will be replaceable by another. This will not hamper originality of design as regards the inner details in the engine. For example, there will be standard location of the bearings, a standard transmission coupling, a standard place and size for each water pipe attachment, etc. For manufacturers who assemble chassis any source of parts supply can be used. If one transmission maker fails to live up to his promises another can supply a gearset which will fit perfectly. The War Department's object in encouraging this standardization is two-fold. The army cannot use fleets of vehicles composed of all sorts of designs without great difficulty. The more the army has of absolutely one design, the better, provided that design is right.

There are several commercial trucks good enough for use, but none that could

not be made still better for military work. Thus the plan of the board is to use the existing machines for first supply and to have later supplies of exactly what they would prefer to get in course of making while the first orders are being delivered immediately. Anything but regular commercial products can be obtained in quantity from only a few manufacturers. On emergency, such as the present, it is only practicable to give orders to makers who can supply rapidly sufficient machines to enable convoys to be composed of one design trucks. This means not less than 1000 of each. To broaden the source of supply it is essential that the smaller makers be enabled to produce trucks so nearly alike that they can be grouped in quantities of 1000, or over, with the same facility that the one-design trucks from larger makers can be grouped.

With the parts makers all in line so that their engines, axles, etc., will interchange, it makes no difference what the capacity of the assembler's plant is. If he can only turn out a couple of chassis a week his output is still worthy of consideration because each of his trucks can be grouped with others from similar small sources of supply and still have the whole fleet possessed of requisite interchangeability. The scheme provides the government with the largest possible market to draw upon. The industry gains in that nobody is too large or too small to be outside consideration.

PIERCE BUILDS ARMY TRUCK

Buffalo, N. Y., June 25-Special telegram-The Pierce army truck, built to conform exactly with the War Department specifications, is being assembled in the Pierce-Arrow plant; the engine being now on the block, it is hoped to have the truck on the road by the end of the week. John Younger, chief engineer of the truck department, states that the specification has worked out extremely well and that he considers the truck to be nearly perfect for military work though, of course, too powerful for its size for commercial purposes. It is understood that the Pierce company does not plan to build this truck for other than military work, but that it is prepared to produce any quantity that the Government may call for.

RED CROSS GIFTS

Flint, Mich., June 22—The General Motors Co. yesterday voted \$10 to the Red Cross fund for every employee, which amounts to some \$250,000. The Buick and Weston-Mott companies here will subscribe \$125,000. The Cadillac and Northway companies of Detroit will subscribe \$75,000; the Oakland and General Motors Truck companies of Pontiac, \$25,000; the Olds company of Lansing, \$15,000, and the Jackson-Church-Wilcox company of Saginaw, \$10,000.

The Ford Motor Co. has given 1,000 Ford ambulances, valued at \$500,000.

Designing Farm Tractors

The Kind of Machine That Should Be Built

This is the first of a series of articles dealing with the problems to be overcome in producing the vast quantity of tractors essential for increasing the world's food supply.—Ed.

THE tractor industry is no flash in the pan; it is as real, as lasting, and as important as the motor industry; perhaps more solid, even. It is not a business to go into with the idea of big, quick profits and hang the rest. It is a business to enter with the idea of building up a great firm.

Taking the manufacturers who today do make or could make tractors, and there are hundreds of them, a dip into the future, ten years hence say, would show twenty of those firms as the leading tractor manufacturers of the world. Among that twenty would be some who are making tractors today, June, 1917; but the possession of a big tractor output this year is no assurance that the maker will not be in some other line of business in three years' time. The man who can have the highest hopes for the future is he who is making the tractor which gives the least trouble and continues to do good work.

No Price Limit

The question is often asked "Is there not a price limit for a popular machine?" The answer is quite definitely "No." There may be an idea at the present that \$1,000 is a goal to strive for in designing a three-plow machine; that other sizes ought to fall between specific limits of price; but it is impossible to uphold this view in argument. Of course, the farmer will buy as cheaply as he can, but he will no more buy the lowest price tractor than he will buy the lowest price motor car or anything else.

Let us not forget that tractor service is the hardest of all, that a truck has an easy life by comparison, and we instantly see that good workmanship in the engine and transmission is absolutely essential. Poor workmanship means disaster and the cheapest tractor is likely to be the most expensive over a period of, say, a year's work. The big chance in this industry now is for good tractors. If they are made good in the first instance they can be cheapened later, in proper manufacturing sequence, but in this day every tractor builder is but digging the foundation for the house of his reputation. The man who takes chances with the foundation is likely to find cracks in the building after it has stood a while.

Just to cite a single example of the sort of harm too great a care for cost can do. In the open market there can be bought very cheaply cooling fans and pulleys for them. There is no stock equipment of this sort, made for motor trucks, of course, that is big enough for tractor work. To use the stock articles dooms the farmer to perpetual belt trouble, means that the water will boil, the engine run hot and eventually damage itself thereby. The dollar or two extra for properly massive fans and fan drives will be earned back by the machine in the first few weeks.

Remember that a small manufacturer does not buy the cheapest machine tools he can get. If his ability to buy new tools is limited he is more likely to buy a good one while he is about it, knowing that it will last long and work economically. The business of the tractor industry is to show that the tractor which does the best work and keeps on doing it the longest is the best proposition.

And the tractor need not be so very expensive at that. The engine is the main essential; the transmission next. After these the frame, wheels, etc., can be of cheap material and rough construction. There is no finish to think about. A good coat of paint protects from rust.

Avoid Foolish Restrictions

What we want to avoid is foolish price "ideals." Suppose a three-plow machine, with the proper workmanship and good design, can be sold for \$1,200 or \$1,500, or any other similar figure; then it is not wise to "trim" it so as to allow it to be marketed a couple of hundred dollars cheaper. It may be argued that the farmer does not know the difference between cast and cut gearing. Perhaps he does not now; BUT HE WILL.

The fascination which tractor design is exercising upon the minds of motor car engineers is a little unexpected. The tractor did not immediately grip the imagination in the way that the airplane did, yet slowly and surely our engineers are finding themselves in the act of thinking out how they would build a tractor.

There is something much deeper in this than the mere business opportunity. Just as almost every motor car engineer worth his salt has pined to design a racing car, so are they pining today to build a tractor.

Now the building of a tractor is both easy and difficult. Compared with the task of producing a good motor car ten years ago it is child's play to build a tractor which will have the requisite power and be reasonably efficient, but there are very little data available to enable us to judge whether the machine which seems to be doing so well is really the sort of thing it ought to be.

For example, we do not yet know what

the speed should be. With plows as now made it is generally thought that from 2 to 2½ m.p.h. is the best speed, but plows have been built to suit horses for centuries, and it may easily be discovered that greatest economy results from plowing at three times the speed with a different sort of plow. The milling machine has ousted the planer for many classes of work. The planing machine was a development from the cold chisel, the milling machine was something new that came after we were accustomed to the idea that mechanical power would be used for machining metal.

The design of agricultural machines is a fairly modern art, but the implement maker has always had to assume horse traction for the field machines; now that he no longer has this limitation to face it is possible, and even probable, that we shall see new plows and other implements which will not be used just as the horse-drawn ones were used. This will react upon the tractor, altering in some ways it specification, so it is fairly safe to predict that it will be ten years before tractor engineering has reached a stage of development comparable with that of the motor car today.

The Type the Trouble

Thus the engineer's difficulty is more to decide what sort of a machine he wants to make than actually to make it. When the broad outline is settled the "inking in" is not so hard. Here it is that motor car experience comes to our assistance. There are problems for the tractor engine designer, but he can be sure of laying out an engine which will be fairly satisfactory. With the transmission, it may turn out rather inefficient, but we know so much about designing gearsets that mechanical mistakes are improbable to the last degree. To sum up, we can design and make without much difficulty any single unit of a tractor, relying mainly upon motor car experience. What we cannot yet do is to be sure the choice of the sort of units and their method of arrangement are correct.

Take one especial feature, that of turning. A four-wheel tractor needs a fair width in which to reverse its direction, which means that the land is plowed by the ordinary process only in the center of the field. Of course this covers the bulk of the surface, but there is a wide strip left which has to be plowed in a different direction. It is not difficult to plow the last parts, but to what extent it pays to alter the design of the tractor to reduce its turning circle we have got to find out by ex-

perience. Some machines will turn literally in their own length; others require a "land" at each end of the furrow of 40 ft. or more. To get the short turn and so cut down the "land" means at present some complication in the transmission; engineers have got to find out whether it is worth while or whether we can get a short turn machine without any offsetting drawback.

Probably the first thing upon which some semblance of agreement will be reached is with respect to size and power. In trucks we have 1-ton, 11/2-ton, 2-ton, 3-ton and 5-ton as the standard list of capacities. There are larger trucks, but the three smallest are the most used. In tractors we have no such convenient rating for laying down a list of types. Sometimes horsepower is mentioned; more often a machine is classified by the number of plows it will pull in "normal" circumstances, and thus we get two-plow tractors, three-plow tractors, and so on. Unfortunately this means very little either to engineer or farmer, because the nature of the earth and of the plow, together with the speed of operation, are factors just as important as the mere number of plows.

Power Truest Index

From an engineering viewpoint the drawbar and the speed will probably come to be the most used factors-that is, the drawbar horsepower. This is not likely to be accepted readily by the farmer as a means of rating for some time to come. His question is "What work will it do?" and we have got to find some way of telling him in terms which he can appreciate.

It might be possible for the tractor division of the S. A. E. standards committee to set up some definitions which would translate drawbar horsepower into number of plows. If agreement could be reached as to the speed at which rating should be made, say 2 m.p.h., and also as to the drawbar required per plow, say 1,000 lb., under normal conditions, we could then rate a tractor in terms of number of bottoms, once the drawbar at the standard speed was known. The writer believes that it will not take very long before the farmer discovers the meaning of horsepower with respect to the ability of a tractor, so that if he knows a machine will deliver so many horsepower continuously he will immediately know what it will do with plows and with all the other mechanisms that a tractor has to operate.

The case is not on all fours with that of the truck. Power in a truck is no index to its carrying capacity, but power is a direct index of a tractor's usefulness either for towing implements or for driving stationary machines. For a threshing machine, for example, the engine power required at the belt is a very definite thing, and a farmer who wants to use his tractor for driving a particular thresher already knows that the tractor engine must have at least so many belt horsepower.

The question of driving threshers and

similar machines may have a profound thresher. Two smaller tractors will do the effect in settling the range of sizes in which tractors will be built. Apparently a tractor with less than 25 to 30 brake-horsepower is considerably limited in this respect-that is, brake-horsepower at the belt pulley. On conventional reckoning a trifle less than 10 hp. in the engine is necessary adequately to handle one plow bottom, allowing for the losses in transmission, which are variously reckoned from 30 to 50 per cent. This means that a tractor big enough to drive a fair-sized thresher is capable of pulling three or perhaps four plows in most sorts of earth. Machines with 20 brake-horsepower or a little less, commonly called two-plow outfits, can only drive a thresher of uneconomically small

Probably the small farmer will be content with a tractor which is big enough for most of his work, leaving out such jobs as threshing. On some farms it may easily pay better to have several small tractors. with the handicap of having to get outside assistance for the heavy stationary jobs than to have one large machine; because the large tractor cannot be used to best advantage in the field unless the areas to be tilled are individually large. Also it must not be forgotten that as long as he depends on horses the farmer is safe to have most of them in good condition at any time; if one falls sick it does not stop his work. Much farm work must be done at the opportune moment. A factory loses a week's earnings if it is forced to shut down for six days; a farmer may lose many months' of earnings by being unable to work as he should for two or three particular days. Thus it is not very safe for a farmer to rely upon just one tractor. Suppose he wants capacity for pulling six plows at once. One big machine will do this and will also drive a substantial

PARCELS POST AS STRIKEBREAKER

Pittsburgh, Pa., June 22-Keen interest is being manifested in the plan successfully tried out in the last several months at Pittsburgh of combining the delivery services of different retail dry good stores in each of the larger cities of the country through the medium of Uncle Sam's motor delivery service. As originated at Pittsburgh, a large department store there faced with the strike of the union motor delivery car drivers called upon Postmaster Guffey to ascertain whether he could handle several thousand parcels post packages in an emergency.

Mr. Guffey said that the government had no interest either way in a strike, but that if the packages were placed in the branch postoffice at the store they would be delivered. This was done and the deliveries made without any attempt at interference with the government truck drivers. Now the National Retail Dry Goods Association plans to adopt this method as a measure of war-time economy.

same plowing but will not drive the thresher. Yet with two tractors a breakdown would only slow work and would not stop it. In times of great stress the half-size machine might be made to plow day and night, so offsetting the absence of the second.

In something the same way one sees in the truck field very often that it is better to use three 2-ton trucks than one 6-ton, although the latter might be more economical provided it could be relied upon to operate continuously without trouble; but a breakdown in transportation seldom is vitally important in the way a delay is vital to the farmer.

The very light tractor, which can at the best only pull one plow bottom, will certainly sell in large quantities, but it will do so in much the same way as a Ford delivery sells. That is to say the small farmer can make economical use of a minimum size tractor just as a small tradesman can economically employ a light passenger car chassis. In both cases first cost is highly important because the man cannot raise more than a certain amount of money. In both cases the desire is to get the best improvement upon the horse that the capital available will supply.

Three Sizes Suit Most Cases

Just as no large business would ever handle its transportation with a huge fleet of the cheapest possible vehicles, so no farmer would ever use a smaller tractor than he could afford to buy-that is, up to a three or four-plow size. For one thing, the cost of labor is highly important. Two men can handle a very large tractor and do a vast deal more work with it than could four men each with a one-man, oneplow machine.

So much for generalities. If we assume that agreement can be reached upon the proper brake-horsepower per plow bottom one thing is clear, and this is that tractors are more likely to be built in multiples of this amount of power than in any other way. Suppose the power per bottom is 5 hp. at the drawbar, the natural sizes in terms of drawbar horsepower would be 10 hp., 15 hp., and so on. Do we need such close steps as this and how far up the scale do we go to reach the limit? Just at present the prevailing opinion in the tractor factories appears to be that the bulk of the machines called for will be made in three sizes, 10 hp., 15 hp. and 20 hp. at the drawbar, at a speed of between 2 and 234 m.p.h. These are otherwise called two, three and four-plow outfits. In this range it seems to be low first cost which is the main factor in the demand for the smallest size, and a good many men in the industry incline to the opinion that for all-round usefulness the 20 drawbar-horsepower machine is the best, better for most work than anything larger and yet big enough to operate economically on almost all the work a medium sized farm has to under-

Motor Men Who Fly

At Curtiss Aviation School

UITE a few men well known in the motor industry are at the Curtiss Aviation School at Newport News, Va. Among those who are members of the S. E. R. C., all of whom are qualified for pilots' licenses and commissions as first lieutenant in the Officers Reserve Corps are shown at the top of this page, reading from left to right, H. W. French, Studebaker Corp., Philadelphia, Pa.; Robert Oldys, assistant manager Coombs Motor Co., Jeffery and Chalmers, Washington, D. C.; Lawrence Schenck, formerly manager Mitchell Motors Co., Philadelphia, Pa.; Frank A. Dickman, assistant manager Buick Co., Philadelphia; Edwin Hubbard, manager Master carbureter agency, Washington, D. C.; Esten B. Koger, eastern sales engineer, Master Carbureter Corp., Los Angeles, Cal., and Detroit.

The small picture that appears below is the last one taken of Victor Carlstrom, chief instructor of the Curtiss Aviation School and one of the best American flyers. He was killed May 9 at Newport News. The picture was taken by Esten K. Koger, another aviator, less than an hour before Carlstrom was killed. With Victor Carlstrom, who is at the left, are Walter Lees, instructor; Steve Cogswell, instructor; Percy Kirkham, assistant chief engineer Curtiss Aero & Motor Corp.; Miles Ermis, assistant chief engineer, wing and fuselage department, Curtiss Aero & Motor Corp., all of whom are stationed at Newport News.

CURTISS PLANT FOR TOLEDO

Toledo, Ohio, June 19—John N. Willys will become the new president of the Curtiss Aeroplane Co. and Toledo will soon have within its boundaries a mammoth plant close to the Willys-Overland Co. factory, for making all Curtiss motors. The



Representatives of the motor industry at aeronautical station, Newport News, Va.

present Curtiss plant at Hammondsport, N. Y., is inadequate to meet present demands.

British experts have visted Toledo and looked over the Overland factory, which they claim is the best fitted plant in the world for making airplane engines. Mr. Willys in a statement says: "The Willys-Overland Co. has been preparing for the manufacture of airplane motors for nearly a year. It has had two engineers who just recently returned in England studying the English method of manufacture, so we are familiar with the latest English and French practice in building motors. We have a surplus quantity of machinery necessary for motor manufacture, so we are in good shape to take care of governmental requirements in connection with the Curtiss company. There is no question about the necessity of the airplane in war, and it is generally conceded by British officers, with whom I have talked, that airplanes will be in general use after the

war because of the large number of aviators trained for fighting."

MARMON TO MAKE AIRPLANES

Indianapolis, Ind., June 22-The Nordyke & Marmon Co. has signed a contract for the construction of a one-story factory building, 100 by 350 ft., to be completed in sixty days to provide additional facilities for the manufacture of airplane motors for the United States Government. The new building will be constructed on a 21-acre site just east of the present Marmon factory, and it is understood on good authority that bids soon will be received for the construction of a second building the same size of that for which plans were just announced. Officers of the company said they cannot estimate at this time how extensive additions to the plant will be until it is known definitely how many motors are to be ordered by the government. The motor to be built by the Marmon company is the Hall-Scott.

PERISCOPE FOR ARMORED CARS

Cleveland, Ohio, June 21-Louis Disbrow, of the Disbrow Motor Car Corp., has designed periscopes for sighting the Lewis guns which will be carried on armored cars to be used for dispatch purposes. These periscopes will provide views for the drivers both ahead and behind and along the side of the car. There will be three periscopes and the driver can be completely inclosed yet witness every action outside of the car. There also will be a slit in the armored body through which observations can be made under ordinary circumstances. In case of danger this slit can be closed and two doors are provided to be swung V-shape in front of the radiator to provide complete protection for the driver and the car.



The last picture of Victor Carlstrom, extreme left, taken an hour before his death

What \$600,000,000 for Airplanes Means

Contemplated Appropriation Might Bring Control of Air and Finally Victory

Washington, D. C., June 18—The contemplated appropriation of \$600,000,-000 for aviation to build various kinds of war planes, to train aviators and mechanics, and perform everything else in connection with the work, is a staggering problem that confronts the motor industry. We mention it as confronting the motor car industry because practically all of this work will have to be cared for by the industry. The aviation industry is capable of caring for but the smallest fraction of it and the motor car industry is the only other one qualified to handle this work. This huge total thrust upon an industry in its swaddling garments is scarcely comprehensible. To gain a conception of its meaning we might think of a similar appropriation having been made for the manufacture of motor cars 15 years ago. It is impossible to comprehend just what this means to the aviation industry in America and as there is scarcely an aviation industry to care for it the conception of what it means to the motor car industry is equally

Drive Germans from Air

The appropriation of \$600,000,000 for aviation means that the Allies are going to make a strong bid to win the war by control of the air, to send enough airplanes, aviators, mechanics, and other necessities to France literally to drive the Germans out of the air on the Western front. Driving them out of the air would be a wonderful accomplishment. It would be equivalent to taking the eye out of the German army. Without their airplanes the Germans could not direct their artillery fire which would be very much reduced in effectiveness. Without the airplanes the Germans could not detect the massing of Allied forces for attacks. With the Germans out of the air the Allies could maneuver their forces for line-turning and other maneuvers which are now rendered impossible by the German airplanes. Once the Germans are driven out of the air it will be possible with a great number of Allied planes to make bombing attacks on German quarters and concentration points and factories, a hundred or more miles back of the lines. It is because of these many possibilities apparently that the War Department at Washington, directed by the Advisory Commission of the Council of National Defense, has drafted such a bold aerial program. Howard E. Coffin and E. A. Deeds are naturally the leaders in the Council of National Defense in this move-

The possibilities of aerial work are shown by the great variety of airplanes necessary in the work. At present the Allies have a tremendous number of airplanes performing eight or ten different kinds of work over the Western front every day. These planes in their different organizations carry on their work for perhaps 15 to 18 hrs. each day, irrespective of weather or other conditions. Their organization is as complete as that of an army of infantry, a squadron of eavalry, or a corps of artillery. No longer is there any question of airplane work. The airplane is working as hard in the storm as in the sunshine. It is no longer a fineweather weapon.

The airplane service is divided into a few divisions as follows: There are planes that go in bombing squadrons, namely to drop bombs on headquarters back of the lines. Such planes have to fly relatively low and are not of the speediest type. Other planes are used entirely by photographers who fly relatively low and are working many hours a day. There are others who do nothing but co-operate with the heavy artillery signaling to them if their fire is accurate and correcting ranges, etc.

Practically all of these three types of planes for bombing, photographing, and directing artillery fire, are not capable of defending themselves from hostile attack and there are two other types of planes whose sole duty is to fight. They are fighting machines. One type is known as the heavy fighting craft which sails at several thousand feet above the planes it is protecting, and the other craft is the highspeed light fighters that might be described as scout machines. These have enormous speeds running as high, it is said, as 120 m.p.h., which is faster than the heavy fighters and much faster than the artillery machines, etc.

In addition there are other duties for airplanes: Some are used for long distance reconnaissance work and fly 20 or 30 miles over the line. There are other machines which do reconnaissance work over the lines only, noting any changes made from day to day.

There are still other machines which accompany the infantry when making attacks and are able to serve as connecting links between the attacking infantry and the headquarter's staff directing the attack.

With these representing a few of the many possible activities for airplanes at the front, it is possible to see how \$600,000,000 will be required for a great program such as planned. To take care of such a program and build such a variety of machines will be no light tax on the motor car industry. The manufacture of engines alone is a big problem to undertake. The manufacture of the planes is also great.

It must be remembered in training aviators there is great destruction. Reports have reached this side that over thirty aviators-in-training are killed per day in England. Should this be the case it means a heavy destruction of machines in this work alone. It has been suggested that America should plan to build 100,000 airplanes. What this means is difficult to grasp. The manufacture of an airplane engine is an immeasurably harder task than manufacturing a motor car engine, in fact, in these days the manufacture of the motor car engine looks like mere play as compared with manufacturing engines for motor trucks, farm tractors, and airplanes. The airplane engine might be described as 100 per cent engine. From the instant it leaves the ground until it returns it is wide open working at its maximum power.

Works at Full Power

The farm tractor engine has been described as a 90 per cent engine because it is under load the majority of its '==:. The motor truck engine might be spoken or as a 40 per cent one, and the motor car engine as a 15 per cent powerplant, in that it is rarely if ever working at full power, such as the airplane engine is.

Because of this greater load on the airplane engine, its manufacture is much more difficult. One engineer has stated that building 100,000 airplane engines would be much more than building 1,500,000 motor car engines. We cannot vouch for these or any similar figures, but the problem of building airplane engines is much greater than that of building motor car engines.

Already active steps are being taken to meet the higher requirements of making airplane engines. Over 100 mechanics have been sent to the airplane factories of Europe to familiarize themselves with the greater care of manufacture. Howard Marmon is at present heading an organization to study the problem in Europe. Other steps are being taken and the industry is setting out in a business way to absorb this new art.

The life of an airplane engine in service on the front is variously stated to approximate 50 hrs., perhaps 75. After that amount of service the engine is removed from the plane, taken apart and rebuilt as necessary. It is reported that in normal service on the Western front that an airplane engine is given approximately 2 hrs.' service each day. One aviator may have five different planes, all of which he may use on the same day. For each aviator there are approximately five mechanics who keep the different engines and planes in commission. It is very rarely

that a plane returns to the ground without having some parts of its wings damaged by shell or other fire.

The short life of an airplane engine as compared with a motor truck engine or a farm tractor engine makes this aviation business immeasurably greater than at first appreciated.

For the present unquestionably the United States will aim at building only machines used for training aviators and not those engaged in actual fighting on the front. If America can build all of the training planes necessary for the training schools of France and England, as well as America, it will leave the French and English airplane factories free to devote all their energies to manufacturing engines and planes for battle use. As time passes naturally America will work into the manufacture of engines and planes for battle work.

The plans are at present to have 3000 or 4000 planes built in America by the coming spring. It may be possible greatly to increase this number, but the production of airplane engines and planes must not be thought of in the same way as motor car production has in the last 2 years. It is expected that America may eventually furnish 30,000 or 40,000 planes for the western front. Some enthusiasts hope that 100,000 planes may be furnished but they have no conception of what furnishing this number means, when the status of airplane engineering in America is duly considered.

Value of Airplanes

It would seem a wise decision on the part of the War Department to plan such tremendous aviation activity. First, the great value of airplanes on the western front would warrant this; second, the shipping facilities of today make such a program highly desirable. It has been suggested that one aviator at the present time is as valuable as a thousand men on the western front. This is a relative statement and not to be applied under every circumstance of attack or drive. With our shipping facilities greatly reduced by submarine attacks, it is good business to ship airplane engines and the knocked-down planes, together with aviators, as compared with requiring a great amount of shipping space for infantry, cavalry, etc.

The \$600,000,000 appropriation for aviation means many other things to the motor car industry. If eventually we furnish 30,000 airplanes to Europe this will require 150,000 mechanics. We cannot spare these from the factories but they must come from the repair shops and the garages throughout the country. This number, if required at once, would mean approximately five from each garage in the country. Such a draft at one time would entirely destroy the motor car and truck maintenance of the country. Fortunately these will be taken in small drafts and at different times so that repair shops and garages will be better prepared to meet the situation.

Make Cars Over Border

Many Makers Establish Branches in Canada to Avoid Custom Taxes

Practice Enables Factories to Sell Cars at American Prices

ETROIT, June 15-The establishment of branch motor car factories in Canada, a common move during the last twelve months, is regarded in many quarters as a wise procedure and as, according to one large maker, very good business at this time. The majority of those concerns who have built Canadian branches has been actuated by the desire to escape duty taxes. Erection and maintenance of a branch factory in Canada, where considerable assembly and some manufacturing is done, is a means of eliminating and avoiding the usual custom taxes, and allows the maker to sell his product in Canada at the same price as in the United States.

To Save Customs

Another stimulant to the Canadian branch building activities has been the possibility of a preferential customs tax arranged between Canada and the various English allies after the war, which many makers foresaw and sought to avoid with their Canadian branches. They feared a discrimination against the United States which would close foreign fields to American made cars.

This, however, now is regarded by the majority of manufacturers as a past possibility, one that might have occurred if the United States had not entered the war, but which surely will not happen since we joined the allies. But there are still some who believe that the possibility of a discriminating preferential customs tax still remains, and these men state that it is good business to erect a Canadian factory branch because it not only exempts the products of that factory from the customs but also places the American maker in a position of safety if Canada receives the benefit of a preferential customs after the war.

All the companies operating Canadian branches do both assembly and manufacturing and have installed machinery capable of turning out complete products. The various motor car makers are manufacturing cars exactly like those made in the United States factories and sell them at the regular U. S. prices.

There is a labor shortage in Canada at present, caused by the war conditions, and many of the plants have installed women workers, who are surprising their employers by the efficient work performed both in offices and machine shops. Many of the American makers have exported American workers to the Canadian branches to complete their working organizations.

Among the motor car and parts makers

who have erected or are erecting Canadian plants are the Ford Motor Co., Ford, Ont.; Willys-Overland Co., West Toronto; Maxwell Motor Co., Windsor, Ont.; Studebaker Corp., Windsor, Ont.; Chevrolet Motor Co., Oshawa, Ont.; Crow Motor Co., London, Ont.; Chalmers Motor Co., Walkerville, Ont.; Saxon Motor Co., Windsor, Ont.; Dodge Bros., Windsor, Ont.; Harroun Motors Corp., Windsor, Ont.; Signal Motor Truck Co., Toronto, Ont.; Fisher Body Corp., Walkerville, Ont.; Champion Spark Plug Co., Windsor, Ont.; Detroit Weather Proof Body Co., Toronto; Kelsey Wheel Co., Toronto; S. K. F. Ball Bearing Co., Toronto; Goodyear Tire & Rubber Co., East Toronto; Marathon Tire & Rubber Co., St. Catharine, Ont.; Acme Tire & Rubber Co., Toronto.

TO EXTEND POSTOFFICE MOTORS

Washington, D. C., June 22—The Postoffice Department, in connection with what
is already an established policy, the use of
motor vehicles in the postal service, is now
ready to extend the use of motor machines
to the star route service. This service is
one which has to do with the carrying of
mail in closed pouches from one postoffice
to another or from an office on the railroad to one not located on the railroad.
Heretofore motor machines have been used
only in cities and in the rural service
which carries mail to individual patrons.
Beginning July 1 hundreds of motor vehicles will be put on Star routes.

TEXAS GOVERNS TRAFFIC

Dallas, Tex., June 22—With the State Highway law which goes into effect July 1, Texas has a new law governing traffic on country roads taking effect at the same time. It also has new laws relating to chauffeurs' licenses, compelling garages, repair and paint shops to keep in a well bound book registration of all repairs, giving the number of the license on the car, the number of the engine, the character of work done, when and how.

One law provides that when a person is fined three times in succession for the violation of the same part of the laws the license shall be revoked and the convicted will not be permitted to again operate cars or other motor vehicles on the highways of the state.

In the same act it is made a misdemeanor for any one to step upon the running board or interfere in any way with a car not his property, when such motor vehicle owner objects. It makes the taking or driving of another's car a felony, punishable by imprisonment in the state penitentiary. It is an aggravated assault for a driver of a motor car to cause a collision with another and injury to any one, punishable by fine or by both fine and imprisonment. In another act is provided license fees for chauffeurs. This fee is \$3 and chauffeurs must wear badges where they may be clearly seen.

German Airplane Motors Described

Study of Aerial Prizes Show How Foreign Types Differ—Sunbeam and Curtiss

OUR immediate concern is not with either the past or future of aerial travel for sport or pleasure but with the grim business of building planes and motors for war and that there is a very real task ahead of us to develop satisfactory aviation motors must be apparent to anyone who has reviewed, in even a casual way, the results of the last three or four years.

The size of the planes and the speed has increased by leaps and bounds during the period of the war. The facility with which man now flies is almost equal to that of birds. The largest sized successful aeroplane motor built up to 1909 was the 100 hp. Antoinette. This year planes have been flown with a total of 1,700 hp.

It was my good fortune to secure from the Baron Charles Huard two of the aviation motors which were shot down in France during the last year. These motors I have had dismantled and am now able to give the full particulars of 170 hp. Benz and another motor of the Mercedes type which is a twin six and which was probably built by Renault.

Mercedes Motor

The 150 hp. six-cylinder Mercedes motor is 140 millimeters bore and 160 millimeters stroke. This type of motor won all the important places in the Kaiser prize contest with the exception of the first prize, which went to the Benz. The Mercedes company started with smaller-sized cylinders, namely 100 millimeters bore and 140 millimeters stroke, six cylinders. The principal features of the design are forged steel cylinders with forged steel elbows for gas passages, pressed steel water jackets, which when welded together forms the cylinder assembly, the use of inclined overhead valves operated by means of an overhead camshaft through rocker arms which multiply with the motion of the cam. By the use of steel cylinders, not only is the weight greatly reduced, but certain freedom from distortion through unequal sections, leaks and cranks are entirely avoided. The construction is necessarily very expensive. It is certainly a sound job. In the details of this construction there are a number of important things, such as finished gas passages, water-cooled valve guides and a very small mass of metal which is watercooled surrounding the spark plug. Of course, it is necessary to use very high compression in aviation motors in order to secure high power and economy and owing to the fact that aviation motors are worked at nearly their maximum, the heat flow through the cylinder, piston, and valves is many times higher than that encountered in automobile motors. It has been found necessary to develop special types of pistons to carry the heat from the center of the head in order to prevent pre-ignition.

In the Mercedes motor the pistons have a drop forged steel head which includes the piston boss and this head is screwed in to a cast iron skirt which has been machined inside to secure uniform wall thickness.

By E. H. Sherbondy

In a paper on "Aviation Motors with Particular Reference to Benz and Mercedes Type," presented at the regular monthly meeting of the Cleveland Section of the Society of Automobile Engineers, June 15, 1917.

The carbureter used on this 150-hp. Mercedes motor is precisely of the same type used on the Twin Six motor which I shall hereafter describe. It has two venturi throats in the center of which is placed the gasoline spray nozzle of conventional type fixed size orifices, immediately above which are placed two panel type throttles with side outlets. An idling or primary nozzle is arranged to discharge above the top of the venturi throat. The carbureter body is of cast aluminum and is water jacketed. It is bolted directly to air passage passing through the top and bottom half of the crank case which passes down through the oil reservoir. The air before reaching the carbureter proper to some extent has cooled the oil in the crank chamber and has itself been heated to assist in the vaporization. The inlet pipes themselves are copper. All the passages between the venturi throat and the inlet valve have been carefully finished and polished. The only abnormal thing in the design of this motor is the short connecting rod which is considerably less than twice the stroke and would be considered very bad practice in motor car engines. short connecting rod, however, possesses two very real virtues in that it cuts down height of the motor and the piston passes over the bottom dead center much more slowly than with a long rod.

Other features of the design are a very stiff crankcase, both halves of which are bolted together by means of long through bolts, the crankshaft main bearings are seated in the lower half of the case instead of in the usual caps and no provision is made for taking up the main bearings. The Mercedes company uses a plunger type of pump having mechanically operated piston valves and it is driven by means of worm gearing.

Overhead Camshaft

The overhead camshaft construction is ex-The camshaft is mounted tremely light. in a nearly cylindrical cast bronze case and is driven by means of bevel gears from the crankshaft. The vertical bevel gear shaft through which the drive is taken from the crankshaft to the camshaft operates at one and one-half times the crankshaft speeds and the reduction to the half-time camshaft is secured through a pair of bevels. On this vertical shaft there is mounted the water pump and a bevel gear for driving two magnetos. The water pump mounted on this shaft tends to steady the drive and avoid vibration in the gearing.

The cylinder sizes of six-cylinder aviation motors which have bene built by Mercedes are

Bore	Stroke	Horsepower		
105	, 140	100.		
120	140	135		
140	150	150		
140	160	160		

The largest of these motors has recently had its horsepower increased to 176 at 1450 This general design of motor has been the foundation for a great many other aviation motor designs, some of which have proved very successful but none of which are equal to the original. Among the motors which follow more or less closely the scheme of design and arrangement are the Hall-Scott, the Wisconsin motor, the Renault, the Packard, the Christofferson and the Rolls-Royce. Each of these motors show considerable variation in detail. The Rolls-Royce and Renault are the only ones who have used the steel cylinder with the steel jacket. The Wisconsin motor uses an aluminum cylinder with a hardened steel liner and castiron valve seats. The Christofferson has somewhat similar design to the Wisconsin with the exception that the valve seats are threaded into the aluminum jacket and the cylinder head has a blank end which is secured to the aluminum casting by means of the valve seat pieces. The Rolls-Royce motors show small differences in details of design in cylinder head and camshaft housing from the Mercedes on which it has taken out patents, not only abroad but in this country.

Renault Motors

The first important peculiarity of the V-type twin six Renault motor of 125 millimeters bore and 160 millimeters stroke is a small angle between the cylinders which is only 471/2 deg. and enables the fuselage to be considerably narrowed in width, thus reducing the head resistance. The cylinders of this motor are almost a duplicate of the Mercedes design of steel cylinder with the exception that the elbows in which the valves are inserted are not so carefully designed and the water jacket is carried around only one side of the exhaust valve stem, whereas in the Mercedes motor the water jacket completely surrounds the exhaust valve stem. It appears to be absolutely essential to cool the exhaust valve as much as possible since pre-ignition is likely to occur always from one of three sources, the spark plug which is the arch offender, the exhaust valve, or the center of the piston head. There are two valves for each cylinder only 66 milimeters or about 2% in. in diameter. The valve port is 61 millimeters or 2½ in. The inlet to the elbow is 53 millimeters in diameter. The valve stems are both 11 milimeters or 76 in. in diameter, with a head approximately in. thick and a 45 deg. angle seat 1/2 in. wide.

It is important in aviation motors to have considerable width of seat as it greatly assists in carrying the heat off the exhaust The end of the valve stem is threaded to carry the spring cup and lock nut. Each of the cylinder bands together with the head are machined from a forged bar after which the intake and exhaust elbows are welded on and finally the pair of cylinders are incased in a jacket which is welded on and finally the pair of cylinders are encased in a jacket which is welded up from three pieces of steel approximately in. thick. The cylinder walls themselves are 3 millimeters or 7 in. thick. A standard two-bolt flange is used for all intake and exhaust port connections and has been profiled milled out of steel. The flanges are screwed on to the cylinders and welded and brazed on to the intake and exhaust pipes.

The pistons are of cast iron and are the only very heavily designed pieces in the motor and it certainly seems as though these could have been considerably lightened. The piston carries three concentric rings which are pinned at the ring gap and have a deep annular rib between the bosses. The pistons are also unusually short, only 95 millimeters Piston pin is 38 milimeters in length. diameter and has a 1/4 in. wall and is locked with a single set screw and cotter pin. There are eighteen 11 in. holes drilled into the skirt, but these holes must have been drilled for oiling purposes, as they do not materially reduce the weight of the pistons, which is 1975 grams.

The connecting rods are of the articulated type and the short rod is alternately arranged from right to left cylinder from the front of the motor to the back.

The connecting rods are made of B. N. D. steel I-beam section with a flange and web of 2 millimeters thickness. The flanges are 26 millimeters and the web is 34 millimeters wide. In the short connecting rod both ends of the rod are alike. The length of the rod is 300 millimeters or 1113 in. The rod cap is secured by means of three bolts, two 11 millimeters in diameter and one of 14 millimeters in diameter.

The crankshaft is carried in four babbittlined bronze shells, which in turn are secured to ribbed steel bearing caps.

The bearing caps are locked in the top of case by means of long U-bolts, such as are sometimes used on automobile spring saddles. The crankshaft has a diameter of 60 millimeters through with the exception of the propeller shaft end where the diameter is increased to 68 millimeters. The crank pins and main bearings are 72½ millimeters long with the exception of the bearing in propeller end, which is 92 millimeters long. The shaft is drilled out for lightness, but oil is carried from the main bearings by means of thrower rings and separate small steel pipes to the connecting rod big ends. The front end of the crankshaft is splined to mount the starting gear and accessory drive.

Renault Carbureter

The carbureter only differs from the Mercedes in that it uses a single float chamber instead of two float chambers. There are two carbureters mounted on either side of the motor bolted to either side of the crankcase by means of long studs and the intakcase, which are fastened by means of unions to the carbureters, are made of copper tubing, 48 millimeters in diameter.

The carbureter has a pair of primary nozzles and a pair of secondary nozzles and an auxiliary air valve which consists of an annular ring mounted concentric with a venturi throat. It would seem that this auxiliary air valve was a dangerous construction to go up in the air with, as it is very likely to stick.

Oil is to be carried through cast ducts in the front and rear compartments of the crank chamber to main bearings. It is also carried from these ducts through two copper tubes up to the overhead cam case and passes through the camshaft case from the propeller to the starting end of the motor and returns down through the distributing gearing ease to the oil sump.

The valve gear is of very elaborate, expensive design. The main scheme of the construction is to use a light steel tube, carried on the studs from the cylinder head, which is slotted to take bronze cages which form both the camshaft bearings and rocker arm mountings. The rocker arms are arranged to multiply the cam motion so that the valve opens 12 millimeters. The camshafts are driven through straight bevel

gear's and the driving shaft driven through straight bevel gears 12½ millimeters face three module and the inclined shafts which drive the camshafts operate at three times camshaft speed. The high speed of these shafts and the resultant lowering in torque on them allows their weight to be considerably decreased.

At first sight it would seem that the construction is a very complicated and expensive one, but this arrangement turns out cheaper and very much lighter than where a train of spur gears is used for driving magnetos, camshafts, etc. The Peugeot company introduced the use of spur gears for overhead camshaft driving and this construction has been copied by Sunbeam, Wisconsin and Packard. In a twin six, or an eighteen-cylinder motor, the number of gears necessary with this gearing arrangement forms a maze of complications. Rolls-Royce, Hall-Scott Hispano-Suiza, and Christofferson used bevel gears for driving the camshaft. All these designs are more or less an imitation of the original Mercedes. A few of the imitators seem to have grasped the importance of operating the auxiliary shaft of the magneto driving There are four magnetos arrangements. mounted on the same axis, each pair being driven through a spur gear, which in turn meshes with a spur gear which is slidably mounted on a splined magneto driveshaft. The magneto driveshaft terminates at its forward end in the sleeve of a bevel gear and is helically splined into the bevel gear so that when longitudinally displaced the shaft is also angularly displaced. This construction is quite costly, but avoids a lot of connections to magneto breaker boxes and it also insures a spark of the same intensity regardless of whether the ignition is advanced or retarded. The author has detailed construction of this motor to some etxent and it would be impossible to give complete important details of construction of this motor without devoting the entire paper to it, and I think it is appreciated that the essential thing in connection with aeronautical motors is keen attention to detail.

At the front end of the crankshaft there is mounted an aluminum six-cylinder air-starting motor which engages the crankshaft by mean's of an overrunning clutch. This air-starting motor has a single inlet discharge valve for six cylinders and of the rotating disk type. There is also built integral with this starter a hand-starting gear and the starting magneto drive.

The Benz Motor

In the Kaiser prize contest for aviation motors a four-cylinder Benz motor of 130 by 180 millimeters won first prize, developing 103 brake horsepower at 1290 r.p.m. The fuel consumption was 210 grams per horsepower hour. Total weight of the motor was 153 kilograms. The oil consumption was .02 of a kilogram per horsepower hour. This motor was afterward expanded into a sixcylinder design and three different sizes were built.

The accompanying table gives some of the details of weight, horsepower, etc.:

the details of weight, horsepowe	r, etc.	• •
Motor type FB	FD	FF
Rated horsepower 85	100	150
Horsepower at 1250 r.p.m 88	108	150
Horsepower at 1350 r.p.m 95	115	160
Bore in millimeters106	116	130
Stroke in millimeters150	160	180
Offset of the cylinders in millimeters	20	20
The rate of gasoline con- sumption in grams240 Oil consumption in grams	230	225
per B. H. P. hour 10	10	10
Oil capacity in kilograms 36	4	41/2
Water capacity in litres 5	1/2 7	1/2 91/

The weight with water and		
oil, but with two mag-		
netos, fuel feeder and air	200	245
pump in kilograms170 The weight of motors includ-	200	240
ing the water pump, two magnetos, double ignition,		
etc160	190	230
The weight of the exhaust pipe complete in kilo-		
grams 4	4.8	51/
The weight of the propeller		
hub in kilograms 3½	4	4
Price including cooling radi- ator in marks10,000 11,	500 14	1,000

The Benz cylinder design is simple, straightforward and every reliable construc-tion and not particularly difficult to manufacture. The cylinder is cast of iron without a water jacket, but including 45 deg. angle elbows to the valve ports. The cylinders are machined wherever possible and at other points have been hand-filed and scraped, after which a jacket which is pressed in two halves is gas welded by means of short pipes welded on to the jacket. The bottom and the top of the cylinders become water gal-leries and by this means separate water pipes with their attendant weight, and complication are eliminated. Rubber rings held in aluminum clamps serve to connect the cylinder together. The whole construction turns out very neat and light. The cylinder walls are four millimeters or & in. thick and combustion chamber is of cylindrical pancake form and is 140 millimeters or 51/2 in. in diameter. The valve seats are 68 millimeters in diameter and the valve port is 62 millimeters in diameter.

The passage joining the port is 57 millimeters in diameter. In order to insert the valves into the cylinder the valve stem is made with two diameters and the valve has to be cocked to insert it in the guide which has a bronze bushing at its upper end to compensate for the smaller valve stem diameter. The valve stem is 14 millimeters or 16 in, diameter and is reduced at its upper portion to 91/2 millimeters. The valves are operated through a push rod and rocker arm construction which is 76 in. and exceedingly light. Rocker arm supports are steel studs with enlarged heads to take a double row ball bearing. A roller is mounted at one end of the rocker arm to impinge on the end of the valve stem and the rocker arm has an adjustable globe stud at the other end. The push rods are light steel tubes with a wall thickness of ¾ of a millimeter and have a hardened steel cup at their upper end to engage the rocker arm globe stud and a hardened steel globe at their lower end to socket in the roller plunger.

Cast Iron Pistons

The pistons are of cast iron, and carry three concentric rings, ¼-in. wide, on their upper end, which are pinned at the joint. The top of the piston forms the frustum of the cone and the pistons are 110 millimeters in length. The lower portion of the skirt is machined inside and has a wall thickness of 1 millimeter. Riveted to the piston head is conical diaphragm which contacts with the piston pin when in place and serves to carry the heat off the center of the piston.

The piston and connecting rods are tubular and have a four-bolt construction on the big end, babbitt-lined bronze bushings and are locked in place by means of connecting rod bolts which pass through the sides of the bushings.

The oil pump assembly comprises a pair of plunger pumps which draw oil from a separate outside pump and constructed integrally with it is a gear pump which delivers the oil under about sixty pounds pressure through a set of copper pipes in the base to the main bearings. The plunger oil pur

shows great refinement of detail. A worm wheel and two eccentrics are machined up out of one piece and serve to operate the plungers.

The mean effective pressures secured in this motor were probably never over 108 pounds and there are certain of the European motors that are now giving 30 deg. higher mean effective than this. In fact, the Benz company have produced a later design with four valves per cylinder of the same size, namely, 130 by 180 millimeters which gives 225 hp. at 1500 turns.

Sunbeam Aviation Motor

This very successful engine has been developed by Louis Coatalen. At the opening of the war the largest sized Coatalen motor was 225 hp., was of the L-head type having a single camshaft for operating valves and was an evolution from the twelve-cylinder racing car which the Sunbeam company had previously built. Since 1914 the Sunbeam company have produced engines of six, eight, twelve and eighteen cylinders from 150 to 500 hp. with both iron and aluminum cylinders. For the last two years all the motors have had overhead camshafts with a separate shaft for operating the intake and exhaust Camshafts are connected through valves. to the crankshaft by means of a train of spur gears, all of which are mounted on two double row ball bearings. In the twin six, 350 hp. engine, operating at 2100 r.p.m., it requires about 4 hp. to operate the camshafts. This motor gives 362 hp. at 2100 revolutions and has a fuel consumption of 51/100 of a pint per brake horsepower hour. The evlinders are 110 by 160 millimeters. The cylinders are 110 by 160 millimeters. same design has been expanded into an eighteen-cylinder which gives 525 hp. at 2100 turns. There has also been developed a very successful eight-cylinder motor rated at 2220 hp. which has a bore and stroke of 120 by 130 millimeters, weight 450 lbs. This motor is an aluminum block construction Three valves with steel sleeves inserted. are operated, one for the inlet and two for the exhaust. One camshaft operates the three valves. This motor is very successful and besides being built by the Sunbeam company, is also being produced by the Austin Motor Co.

The modern Sunbeam engines operate with a mean effective pressure of 135 lbs. with a compression ratio of 6 to 1 at sea level. The connecting rods are of the articulated type as in the Renault motor and are very short. The weight of these motors turns out at 2.6 lbs. per brake horsepower, and they are able to go through a 100-hour test without any trouble of any kind. The lubricating system comprises a dry base and oil pump for drawing the oil off from the base, whence it is delivered to the filter and cooling system.

It then is pumped by a separate high pressure gear pump through the entire motor. In these larger European motors, castor-oil is used largely for lubrication. It is said that without the use of castor-oil it is impossible to hold full power for five hours. Coatalen favors aluminum cylinders rather than cast iron.

The Curtiss Aviation Motors

The Curtiss OX motor has eight cylinders, 4-in. bore, 5-in. stroke, delivers 90 hp. at 1400 turns, and the weight turns out at 4.17 lbs. per hp. This motor has cast iron cylinders with monel metal jackets, overhead inclined valves operated by means of two rocker arms, push and pull rods from the central camshaft located in the crankcase. The cam and push rod design is extremely ingenious and the whole valve construction turns out very light. This motor is an evolution from the early Curtiss type motor which was used by Glenn Curtiss when he won the Gordon Bennett Cup at Rheims. A slightly larger edition of this type motor is

the OXX, which has cylinders 41/4 in. by 5 in., delivers 100 hp. at 1400 turns and has the same fuel and oil consumption as the OX type motor, namely, 6 lbs. of fuel per brake horsepower hour and .03 lb. of lubricating oil per brake horsepower hour. The Curtiss company have developed in the last two years a larger-sized motor now known as the V-2, which was originally rated at 160 hp, and which has since been refined and improved so that the motor gives 220 hp. at turns, with a fuel consumption of 52/100 of a pound per brake horsepower hour and an oil consumption of .03 of a pound per brake horsepower hour. This larger motor has a weight of 3.45 lbs. per horsepower and is now said to be giving very satisfactory service. The V-2 motor has drawn steel cylinders with a steel water jacket top and a monel metal cylindrical jacket, both of which are brazed on to the cylinder barrel itself. Both these motors use side by side connecting rods and fully forced lubrication. The camshafts act as a gallery from which the oil is distributed to the camshaft bearings, the main crankshaft bearings, and the gearing. Here again we find extremely short rods, which, as before mentioned, enables the height and the consequent weight of construction to be very much reduced. For ordinary flying at altitudes of 5000 to 6000 ft., the motors are sent out with an aluminum liner, bolted between the cylinder and the crankcase in order to give a compression ratio which does not result in pre-ignition at a low altitude. For high flying, however, these aluminum liners are taken out and the compression volume is decreased to about 18.6 per cent of the total volume.

Austro-Daimler

One of the first very successful European flying engines which was developed in Europe is the Austro-Daimler, which was built after the designs of Herr Porsche, The first of these motors had four cylinders, 120 by 140 millimeters, bore and stroke, with cast-iron cylinders, overhead valves operated by means of a single rocker arm, controlled by two cams and the valves were closed by a single leaf spring which oscillates with the rocker arm. The cylinders are cast singly and have either copper or steel jackets applied to them. The four-cylinder design was afterwards expanded to the six-cylinder design and still later a six-cylinder motor of 130 by 175 millimeters was developed.

This motor uses an offset crankshaft, as does the Benz motor, and the effect of offset will be discussed later on in this paper. The Benz motor also uses an offset camshaft which improves the valve operation and changes the valve lift diagram. In my estimation the intake pipe and carbureter arrangement on this engine are the best of any of the aviation motors.

The lubrication also is different than any other aviation motor, since individual high pressure metering pumps are used to deliver fresh oil only to the bearings and cylinders, as was the custom in automobile practice some 10 years ago.

JAMAICA HAS 833 CARS

The latest official census from Jamaica gives a total of 833 motor cars and trucks, which taken with a population of 850,000, all told, reflects a general prosperity. Those 2213 miles of main roads open for traffic, most of them macadamized highways, explain in part at least the proportion of motor vehicles to the number of residents. While the rainfall in certain parts of the island is excessive the roads are kept in good repair. American cars have the preference over all other

foreign makes. In 1915 95 per cent of the total imports of cars and trucks came from the United States.

Motor cars first became popular in Jamaica in 1909, when the total import amounted to \$74,783 in value. The next year the valuation increased to \$149,389, and in 1911 the imports of motor cars amounted to \$207,543.

The best selling cars have been those costing less than \$1,000, that is, at the American factory. Upkeep is very expensive. Gasoline was selling at 49 cents and 61 cents a gallon at the beginning of the year. Tires ranged from \$11.70 for the 30 by 3 and \$15.35 for the 30 by 3½ to as high as \$48.70 for the large sizes. A fairly efficient chauffeur, however, costs only \$5 and keep a week. Freight charges are very high, and motor cars are dutiable at the regular ad valorem rate of 16½ per cent.

Practically all the dealers are located at Kingston, the capital and largest city in Jamaica. Several American manufacturers have excellent representation, but others have seriously injured their prospective business by ill-advised agencies. Advertising is cheap and used to sell the cars often, though most of them are sold by personal solicitation. The usual terms are part cash and installments.

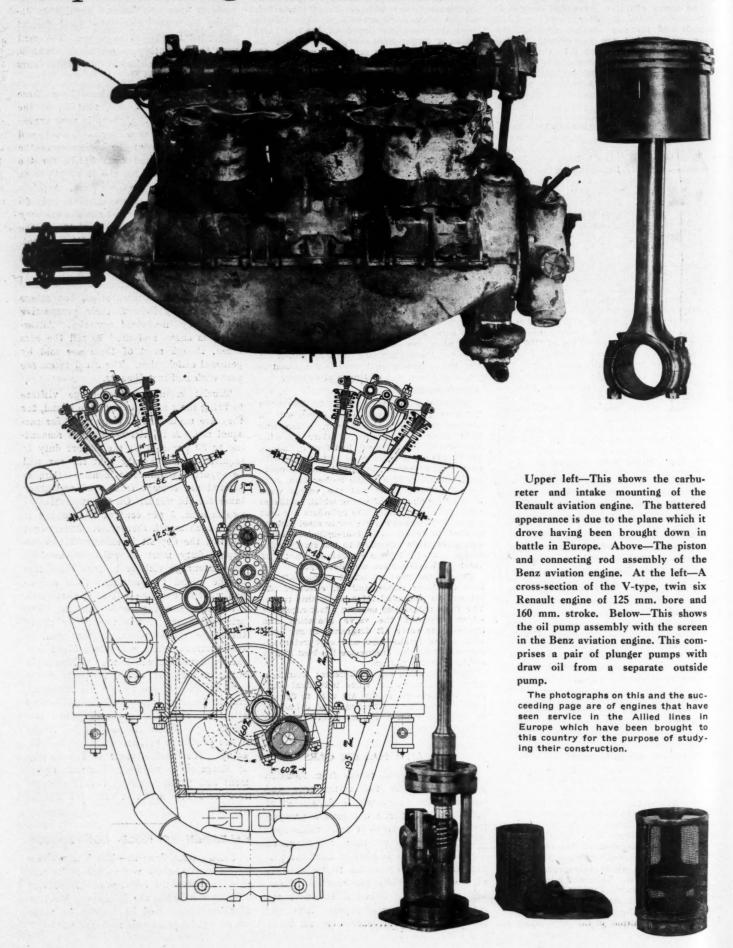
Tourist regulations encourage visitors to bring their motor cars to the island, for they are made free of duty when for personal use. A reimbursed deposit amounting to 30 per cent of the import duty is required as a guaranty that the car will be exported within two months. Cars so entered are exempt from road and other taxes for six weeks. On the expiration of two months, 5 per cent of the deposit is taken each month thereafter. After eight months, the deposit is exhausted and the import duty must be paid. Steamships also encourage visitors to take their cars to the island by providing their accompaniment as baggage and at special rates.

Jamaica has few motor trucks. The principal users of the twenty or thirty there are the corporations that deal in agricultural produce, a few individuals and the Government, which uses British-made trucks for mail service to all parts of the island. The private owners use American trucks, usually 3 tons, equipped with dual solid rear tires, high-stake body and tarpaulin top. While the market for trucks is not profitable perhaps, it is not discouraging. The establishment of any agency at Kingston is advised. Unusual equipment and parts, however, both for motor cars and for motor trucks, should be avoided.

SALESMEN TO HOLD CONVENTION

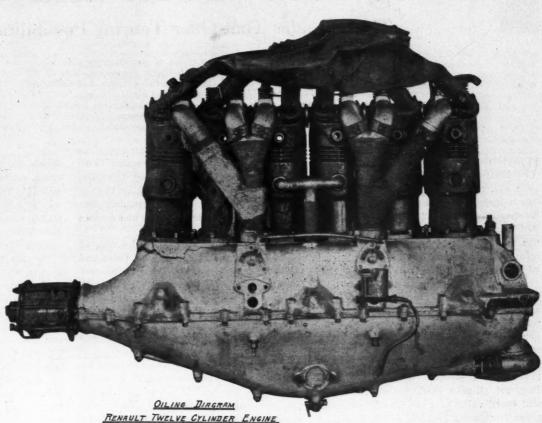
Toledo, Ohio, June 22—The Willys-Overland Co. will hold a convention of its star retail salesmen in September. A contest of sales will decide the delegates. Election to the congress will be decided by votes which will be points for each car sold.

Airplane Engines That Have Seen Service



Now Being Studied by American Engineers





Above-This shows the design of the Benz cylinder. It is a simple and straight-forward design and not particularly difficult to manufacture. Upper right-The Benz aviation engine from the carbureter and intake side. Right-Oiling system of the Renault aviation engine. Oil is carried through the cast ducts in the front and rear compartments of the crank chamber to the main bearings. Below-Piston and connecting rod assembly of the Renault aviation engine. Lower right-A cross-section at right angles to the crankshaft of the 150 h.p., six-cylinder Mercedes aviation engine, which has a bore of 140 mm. and a stroke of 160

The engines from which these photographs are taken are in the possession of the Peerless Motor Car Co., which is particularly interested in such development.

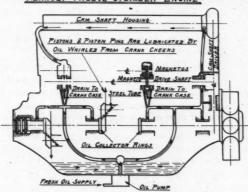
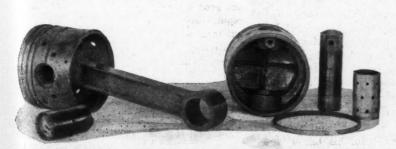
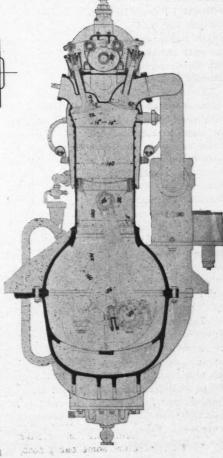


FIGURE 2-A





Linking New York and Chicago

Three Routes That Offer Touring Possibilities

WITH this issue MOTOR AGE begins a series of weekly reports in which will be covered during the touring season the main routes between the major cities of the United States. No effort will be made to give points of interest on these routes, but rather to give the tourist such information as will be valuable to him in making his tour in comfort. In this series of reports will be told the kind of roads you may expect in the various localities and where there is new construction and repair that may make detours necessary. If these detours are necessary they will be described and the probable time given during which a change of routing will be required.—Editor.

With the opening of the touring season Motor Age begins a series of reports on roads, their type and travelability between the principal cities of the country. No specific schedule will be adhered to, nor will comparisons of scenic attractions of one road as against another be given, but information of practical value to the tourist will be detailed. It is assumed that you, Mr. Tourist, if you are planning a tour of a week of two weeks, or more, naturally will want to know what kind of roads you will find on the particular trip you have laid out. If there are bad stretches that require detouring you should know it in advance. Also, if a road is one that is not affected by bad weather, is in fact, an all-year road, such information will be of value to you. The information given from week to week will be obtained through various sources such as the Automobile Blue Book reports, letters from tourists and from road associations and motor clubs. Once a route is described it will not be described again except when changes are made, such as reconstruction which makes detours necessary, or when the work has been completed and the necessity for detouring has been removed.

Chicago to New York

This week we will take up the main routes between Chicago and New York, with some branch roads to other large cities close to the main-traveled highways. There are three routes to New York, the most direct of which is by way of South Bend and Kendallville, Ind., Bryan, Wauseon, Toledo, Fremont, Norwalk, Elyria, Oberlin, Cleveland, Ashtabula and Conneaut, Ohio, Erie, Pa., Buffalo, Batavia, Geneva, Syracuse, Utica, Schnectady, Albany and Poughkeepsie, N. Y. This is the shortest route with practically all good road. For example between Chicago and Toledo the road is hard, but much of it might be called a 20-mile road. There are some rough stretches between Wauseon and Toledo, Ohio, but the majority of it is gravel or macadam. At Wauseon the better road to Detroit branches off, going through Adrian, Saline, Ypsilanti. One can also leave this main route at Toledo and go to Detroit through Ida and Monroe. From Toledo to Cleveland the road is all good and from Cleveland to Ashtabula it is boulevard. From Ashtabula on through Erie to Buffalo there are some bad places,

but fairly good time can be made. Two days can be saved by shipping from Detroit to Buffalo, a charge of \$15 for the car and \$3 per passenger being made. The boat leaves Detroit at 6 o'clock and reaches Buffalo at 9 a. m.

From Buffalo to New York, by way of Batavia, Canandaigua, Syracuse, Utica and Albany the road is good the year around. This route takes in the Mohawk trail. There is little difference between the roads on the east side of the Hudson from Albany to Kingston, although the road on the east side of the river should be followed through Poughkeepsie to New York.

There is a route perhaps more scenic between Westfield and Kingston, N. Y., which takes more time and is not so good as the one previously mentioned. This is by way of Jamestown, Olean, Hornell, Elmira and Binghamton. The side trip from Elmira north to two of the Finger Lakes and back to the main route at Owego is bad dirt.

The Lincoln highway from Chicago to Pittsburgh is a third choice to the east. East of Fort Wayne there are stretches

BATTERY SERVICE BROADENED

Detroit, June 25—A restroom for women, telephones and magazines for patrons' use, all service given inside, testing and opening the batteries in the presence of customers—these are a few of the features that make the Willard service station here something different.

Briefly, the building covers 25,000 sq. ft. In front are offices, telephone booths and restroom. Immediately back is the garage, capable of accommodating seventy-five cars. Back of that are the charging rooms, repair shop and stockroom.

The station is built from a customer's point of view in that the owner drives in the front door and is met immediately by a floorman. If his battery is to be tested and filled, the work is done at once and he goes out of one of the side doors. If his battery needs repairs or recharging the car is placed in a stall, the battery is removed and "a renter" installed in its place. The owner's battery is taken to the office and tested while the customer himself looks on. The owner sees what the battery needs, gives the order for this work, gets a receipt for his battery and goes on.

which tourists recently passing over this route say require "four hours to go 12 miles." Through Ohio the Lincoln highway is not very desirable in a number of places and either the northern route to New York, or the one to be described later has the advantage.

For the tourist who is not in a hurry, that is, who does not mind extra mileage if roads are good, a roundabout route to New York is from Chicago through Indianapolis, Richmond, Ind., Dayton, Springfield, Columbus and Zanesville, Ohio, to Washington, Pa., where an option of the Lincoln highway through Pittsburgh, Bedford, Gettysburg and Lancaster to Philadelphia, or by way of Cumberland and Hagerstown, Md., to Washington, Baltimore and Philadelphia is offered. From Philadelphia the route to New York is by way of Trenton and Elizabeth, N. J.

Good Roads to Indianapolis

This latter route out of Chicago may be utilized in reaching Louisville or Cincinnati from Chicago. The road into Indianapolis is good all the way, as is that from the Hoosier metropolis to Columbus, varying between gravel and macadam. From Columbus to Zanesville it is all new brick. The more southern of these options from Washington, Pa., to Philadelphia is the Old National Road and is good macadam almost the entire distance, while the Lincoln highway from Pittsburgh east to Philadelphia is fine macadam, always good. The road up the coast takes in stretches of the best road to be found anywhere in the country. From Elkton, Md., to Chaster, Pa., there is a short stretch that runs fair-to-poor, but may be called a 20-mile

There is a cut-off between Cleveland and Pittsburgh of about 150 miles of which about 50 miles is bad dirt. Dirt roads, on account of the peculiar season this year are not good anywhere in the country. It will require several weeks of good weather to put them in shape. However, on the routes mentioned to New York from Chicago there is very little dirt. The map produced herewith shows the routes mentioned and the numbers with the legends corresponding indicate the type of construction and the usual condition of these routes. There is opportunity offered for some fine circle tours in these three main routes to New York from the Middle-Western metropolis.



Hoopeston, Ill.-Colorado Springs, Colo.

HOOPESTON, Ill.—Editor Motor Age—Advise route from here to Colorado Springs.

J. W. Brier.

From Hoopeston the route leads to Bloom-Lincoln, Elkhart, Williamsville, ington, Springfield, Litchfield, Mount Olive, Staunton, Hamel, Edwardsville, Maryville, Collinsville, East St. Louis, Ill., St. Louis, Mo., St. Charles, Cottleville, Wentzville, Wright City, Warrenton, Williamsburg, Fulton, Columbia, Midway, Rocheport, New Franklin, ferry across Missouri river, Boonville, Arrow Rock, Marshall, Grand Pass, Waverly, Dover, Lexington, Wellington, Levasy, Independence, Kansas City, Kansas City, Kans., Bonner Springs, De Soto, Eudora, Lawrence, Topeka, Silver Lake, Rossville, St. Mary's, Wamego, Wabaunsee, Manhattan, Ogden, Fort Riley, Junction City, Chapman, Detroit, Abilene, New Cambria, Salina, Ellsworth, Wilson, Dorrance, Russell, Victoria, Hays, Yocemento, Ellis, Ogallah, Wakeeney, Quinter, Grainfield, Oakley, Colby, Brewster, Goodland, Ruleton, Kanorado, Kan., Burlington, Col., Stratton, Seibert, Flagler, Limon, Ramah, Calhan to Colorado Springs.

Vols. 5 and 7 of the Automobile Blue Books, published by the Automobile Blue Book Publishing Co., 910 South Michigan avenue, Chicago, contain complete running directions for this trip.

Cincinnati, Ohio-St. Petersburg, Fla.

Bradford, Ohio—Editor Motor Age—Advise the best route from Cincinnati to Jacksonville or St. Petersburg, Fla.—Samuel Hart.

From Cincinnati drive to Mack, Cleves, Ohio, Homestead, Ind., Lawrenceburg, Aurora, Oberdeen, Vevay, Ohio River ferry, Carrollton, Ky., New Castle, Eminence, Shelbyville, St. Mathews, Louisville, Shively, Orel, Meadowlawn, West Point, Elizabethtown, Upton, Bonnieville, Munfordville, Woodsonville, Rowletts, Horse Cave, Cave City, Glasgow Junction, Bowling Green, Shakertown, Auburn, Russellville, Adairville, Springfield, Tenn, Green Brier, Goodlettsville, Edenwold, Madison, Nashville, LaVergne, Jefferson, Walter Hills, Murfreesboro, Deason, Shelby-

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ville, Bellville, Fayetteville, Hazel Green, Ala., Meridianville, Huntsville, Ala., Owens Cross Roads, New Hope, Cottonville, North, Tennessee River ferry, Gunterville, Albertville, Boaz, Mountainboro, Attalla, Alabam City, Gadsden, Rome, Ga., Cartersville, Emerson, Allatoona, Acworth, Kennesaw, Marietta, Smyrna, Atlanta, Mount View Station, Darseys Cross Station, Jonesboro, Love-Hampton, Pomona, Griffin, Milner, Barnesville, Forsyth, Lorane Station, Macon, Perry, Henderson, Vienna, Graydon, Cordele, Arabi, Sibley, Worth, Ashburn, Sycamore, Eldorado, Staunton, Lenox, Sparks, Adel, Cecil, Hahira, Mineola, Valdosta, Lake Park, Ga., Jennings, Jasper, Genoa, White Springs, Suwanee, Winfield, Lake City, Watertown, Olustee, Saunderson, Macclenny, Baldsin, Whitehouse, Jacksonville, St. Johns River ferry, Durbin, Woodland, St. Augustine. New Augustine, Elkton, Deep Creek, Hastings, Byrd, Bunnell, Ormond, Daytona, Deland, Orange City, Monroe, Sanford, Longwood, Altamonte Springs, Maitland, Winter Park, Orlando, Pinecastle, Taft, Kissimmee, Campbell, Loughman, Davenport, Haines City, Lake Alfred, Auburndale, Carters, Lakeland, Youmans, Plant City, Dover, Seffner, Mango, Oak Park, Tampa, Safey Harbor, Bayview, Pinellas Park, to St. Petersburg,

Vol. 6 of the Automobile Blue Books, published by the Automobile Blue Book Publishing Co., 910 South Michigan avenue, Chicago, contains complete running directions for this trin.

Hattiesburg, Miss.-New York

Hattiesburg, Miss.—Editor Motor Age—Give route from here to New York.—J. L. Doyle.

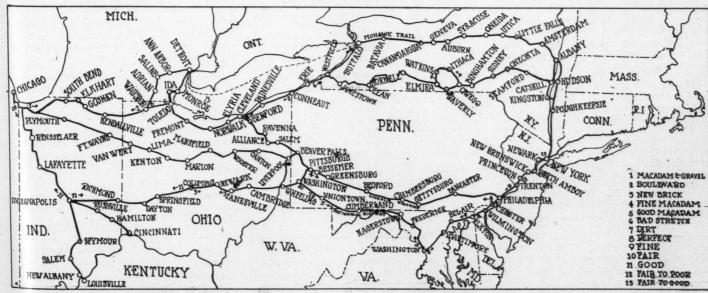
From Hattiesburg proceed to Ellisville, Laurel, Saundersville, Heidelberg, Shubuta, Quitman, Meridian, Livingston, Coatopa, Moscow ferry, Demopolis, Faunsdale, Uniontown, Blalock, Safford, Martin Station, Orrville, Hazen, Beloit, Selma, Benton, Lowndesboro, Burkville, Montgomery, Mount Meigs, Shorter, Tuskegee, Notasulga, Loachapika, Auburn, Opelika, Beulah, Langdale, Lanett. West Point, Lagrange, Louise, Hogansville, Trimble, Grantville, Moreland, Newman, Union City, Stonewall, Fort McPherson, Atlanta, Druid Hills, Decatur, Ingleside, Clarkston, Stone Mountain, Snellville, Grayson, Between, Monroe, Athens, Neese, Ila, Franklin Springs, Royston, Hartwell, Browns ferry, Anderson, S. C., Grove, Greenville, Burlington, Graham, Mebane, Hillsboro, Durham, Bragtown, Knapp of Reeds, Stem, Providence, Oxford, Stovall, Bullock, N. C., Clarksville, Boydton, South Hill, Kembridge, Blackstone, Petersburg, Manchester, Richmond, Ashland, Coatesville, Mantico, Chilesburg, Partlow, Small, Spotsylvania, Fredericksburg, Falmouth, Mountain View, Garrisonville, Dumfries, Occoquam, Lorton, Accotink, Alexandria, Washington, D. C., Beltsville, Laural, Baltimore, Kingsville, Bel Air, Churchville, Aberdeen, Havre de Grace, Perrysville, Pincipio Furnace, Charlestown, North East, Elkton, Newark, Del., Wilmington, Marcus Hook, Pa., Chester, Norwood, Darby, Philadelphia, Bustleton, La Trappe, Langhorne, Trenton, Lawrenceville, Princeton, Kingston, Franklin Park, New Brunswick, Metuchen, Isolin Sta-Rahway, Elizabeth, Newark, Jersey City, Weehawken ferry, New York.

Vol. 6 of the Automobile Blue Books, published by the Automobile Blue Book Publishing Co., 910 South Michigan avenue, Chicago, contains complete running directions for this trip.

Canton, Ill.-Boston, Mass.

Canton, Ill.—Editor Motor Age—Would like best route from here to Boston, and approximate mileage.—H. T. Cooper.

The route follows through Gravel Hill, Wayland, Keokuk, Hamilton, Ill., Elvaston, Carthage, Burnside, Laharpe, Roseville, Monmouth, Galesburg, Knoxville, Brimfield, Kickapoo, Peoria, Washington, Metamora, Lowpoint, Washburn, Varna, Mount Palatine, Tonica, Ottawa, Morris, Minooka, Joliet, New Lenox, Frankfort, Dyer, Ind., Shererville, Merrillville, Valparaiso, Laporte, South Bend, Mishawaka, Elkhart, Goshen, Benton, Ligonier, Wawaka, Brimfield, Kendallville, Butler, Edgerton, Ohio, Bryan, Archbold, Wau-



This map shows the three major routes to New York from Chicago and the numbers and legends indicate what the tourist may expect of road surface between the points where corresponding figures are found. The dotted line through Lake Erie shows where two days may be saved by shipping the car at a cost of \$15

seon, Toledo, Lemoyne, Woodville, Fremont, Clyde, Bellevue, Monroeville, Norwalk, Townsend, Wakeman, Oberlin, Elyria, Morleys Cor-Cleveland, Willoughby, Painesville, ners, Unionville, Geneva, Ashtabula, Conneaut, Ohio, Girard, Erie, Harbour Creek, Moorheadville, North East, Pa., Ripley, N. Y., Forsyth, Westfield, Portland, Brocton, Lamberton, Fredonia, Sheridan, Silver Creek, Irving, Brant, Angola, Evans, Bay View, Buffalo, Snyder, Williamsville, E. Pembroke, Batavia, Leroy, Caledonia, Ayon, East Ayon, Lima, West Bloomfield, Canandaigua, Geneva, Waterloo, Seneca Falls, Auburn, Sennett, Elbridge, Cammilus, Syracuse, Manlius Center, Mycenae, Chittenango, Canastota, Wampsville, Oneida Castle, Vernon, Utica, Frankfort, Ilion, Mohawk, Herkimer, Little Falls, Johnsville, Nelliston, Palatine Bridge, Fonda, Tribes Hill, Amsterdam, Scotia. Schenectady, Albany, Rensselaer, East Green-bush, New Lebanon, Shaker Village, Mass., Pittsfield, Lenox, Lee, Bonnyrigg, Huntington, Russell, Woronoco, Westfield, Springfield, North Wilbraham, Palmer, Warren, Brookfield, Spencer, Leicester, Worcester, Shrewsbury, Northboro, Marlboro, South Sudbury, Wayland, Weston, Auburndale, Newton, Coolidge Corner, to Boston. This trip approximates 1,325 miles.

Vols. 5, 4, 1 and 2 of the Automobile Blue Books, published by the Automobile Blue Book Publishing Co., 910 South Michigan avenue, Chicago, contain complete running directions.

Owensboro, Ky.-Birmingham, Ala.

Owensboro, Ky.—Editor Motor Age—Give route from here to Birmingham, Ala.—W. L. Hitt.

From Owensboro proceed to Henderson, Weaverton, Cairo, Poole, Wanamaker, Dixon, Nebo, Madisonville, Earlington, Barnsley, Nortonville, Crofton, Hopkinsville, Clarksville, Adams, Cedar Hill, Springfield, Nashville, Denbar, Franklin, Spring Hill, Meapolis, Columbia, McCains, Waco, Pulaski, Elkmont, Ardmore, Hollands Gin, Elkmont, Ala., Athens, Tennessee River ferry, Decatur, Albany, Flint, Hartsells, Falkville, Cullman, Hanceville, Garden City, Blountsville, Cleveland, Oneonta to Birmingham.

Vols. 4 and 6 of the Automobile Blue Books, published by the Automobile Blue Book Publishing Co., 910 South Michigan avenue, Chicago, contain complete running directions for this trip from Henderson on.

Shreveport, La.-Niagara Falls, N. Y.

Shreveport, La.—Editor Motor Age— Would like best routing from here to Niagara Falls, N. Y.—J. B. Herold.

From Shreveport the route follows: Minden, Arhens, Arcadia, Simsboro, Ruston, Choudrant, Calhoun, Monroe, Bastrop, Oak Ridge, ferry across Lake LaForche, Girard, Rayville, Holly Ridge, Delhi, Ferry, Waverly, Quebec, Tallulah, Delta, La., Mississippi Quebec, Tallulah, Delta, La., Mississippi River ferry, Vicksburg, Miss.; Edwards, Bolton, Jackson, Brandon, Fannin, Pisgah, Morton, Forest, Newton, Hickory, Chunky, Meridian, Daleville, DeKalb, Macon, Brookville, Crawford, Columbus, Vernon, Ala., Guin, Hamilton, Hackleburg, Duketon, Russellville, Tuscumbía, Sheffield, Florence, St. Florian, St. Joseph, Tenn., Loretto, Leone, Lawrence-burg, Rockdale, Sandy Hook, Mt. Pleasant, Columbia, Spring Hill, Franklin, Nashville, Madison, Edenwold, Gootlettsville, Green Brier, Springfield, Tenn., Adairville, Ky.; Russellville, Auburn, Shakertown, Bowling Green, Glasgow Junction, Cave City, Horse Cave, Rowletts, Woodsonville, Munfordville, Bonnieville, Upton, Elizabethtown, West Point, Meadowlawn, Orel, Shively, Louisville, Shelbyville, New Castle, Carrollton, Ky., ferry across Ohio river, Oberdeen, Rising Sun, Aurora, Lawrenceburg, Homestead, Ind. Cleves, Cincinnati, Sharon, Mason, Lebanon,

Waynesville, Xenia, Cedarville, South Charleston, London, West Jefferson, Columbus, Granville, Newark, Hanover, Frazeysburg, Dresden, Coshocton, Newcomerstown, Port Washington, Gnaddenhutten, Uhrichsville, New Philadelphia, Dover, Strasburg, Beach City, Navarre, Massillon, Canton, Akron, Ghent, Brecksville, Cleveland, Willoughby, Painesville, Unionville, Geneva, Ashtabula, Conneaut, Ohio, Girard, Erie, Harbour Creek, Moorheadville, North East, Pa.; Ripley, N. Y., Westfield, Portland, Lamberton, Fredonia, Sheridan, Silver Creek, Irving, Brant, Angola, Evans, Bay View, Buffalo, to Niagara Falls.

Vols. 7, 6 and 4 of the Automobile Blue Books, published at 910 South Michigan avenue, Chicago, contain complete running directions for this trip.

Hinckley, Ill.-Cadiz, Ohio

Hinckley, Ill.—Editor Motor Age—Would like routing from here to Cadiz, Ohio.—J. A.

From Hinckley, Ill., proceed to Aurora, Naperville, Chicago, South Chicago, Hessville, Highland, South Gary, Hobart, Wheeler, Valparaiso, Westville, Laporte, South Bend, Ligonier, Merriam, Churubusco, Fort Wayne, New Haven, Ind., Van Wert, Ohio, Delphos, Lima, Kenton, Meeker, Marion, Delaware, Columbus, Granville, Newark, Jacksontown, Linnville, Zanesville, Cambridge, Uhrichsville, Dennison, to Cadiz.

Vol. 4 of the Automobile Blue Book, published by the Automobile Blue Book Pub. Co., 910 South Michigan avenue, Chicago, contains complete running directions for the above trip.

Chicago-Winnipeg, Can.

Maywood, Ill.—Editor Motor Age—Outline a route from Chicago to Montmarte, Sask., via Cedar Rapids, Waterloo, Iowa, Minneapolis and St. Cloud, Minn.—J. L. Hoff.

As we have no route information on Canadian roads west of Winnipeg, we are routing you only to that point and would suggest that you get information from the Winnipeg Automobile Club as to your way west from there. From Chicago proceed to Maywood, Elmhurst, Lombard, North Glen Ellyn, West Chicago, Geneva, DeKalb, Creston, Rochelle, Ashton, Dixon, Sterling, Morrison, Fulton, Clinton, Dewitt, Grandmound, Wheatland, Mechanicsville, Mount Lowden, Marion, Cedar Rapids, Newhall, Vinton, Laporte City, Washburn, Waterloo, Janesville, Waverly, Plainfield, Nashua, Charles City, Orchard, Osage, Mitchell, Lyle, Austin, Lansing, Blooming Prairie, Owatonna, St. Lansing, Blooms, Minneapolis, Paul, Minneapolis, Robbinsdale, Osseo, Champlin, Anoka, Elk River, St. Cloud, St. Joseph, Avon, Albany, Freeport, Sauk Center, West Union, Osakis, Alexandria, Garfield, Grandon, Eyansville, Ashby, Fergus Falls, Elizabeth, Elizabeth, Rothsay, Barnesville, Baker, Moorehead, Fargo, Mapleton, Hillsboro, Taft, Reynolds, Thompson, Merrifield, Grand Forks, Manvel, Ardoch, Minto(Grafton, Auburn, St. Thomas, Glasston, Hamilton, Pembinareport at U. S. Customs House-Emerson. Man.-report at Canadian custom house Letellier, St. Jean Baptiste, Morris, St. Agathe, St. Norbert, Winnipeg.

Vol. 5 of the Automobile Blue Books, published by the Automobile Blue Book Pub. Co., 910 South Michigan avenue, Chicago, contains complete running directions for the above routing.

Bretton Woods, N. H.-Chicago-Denver, Col.

Denver, Colo.—Editor Motor Age—Outline a route from the White Mountain District of New Hampshire to Denver, via Chicago.— H. A. Lindsley.

From Bretton Woods the route follows, Twin Mountain House, Bethlehem Junction, Bethlehem, Littleton, Lisbon, Bath, Haverhill, Piermont, Orford, Lyme, Hanover,

White River Junction, Hartford, Quechee, Taftsville, Woodstock, Bridgewater, Sher-burne, Mendon, Rutland, Fairhaven, Whitehall, N. Y., Comstock, Fort Ann, Kingsbury, Hudson Falls, Glens Falls (detour to Lake George if desired), Wilton, Saratoga Springs, Ballston Station, Manny Corners, Amsterdam, Schenectady, Amsterdam, Fort Johnson, Fonda, Palatine Ridge, St. Johnsville, Little Falls, Herkimer, Mohawk, Frankfort, Utica, Vernon, Wampsville, Canastota, Chittenango, Manlius Center, East Syracuse, Syracuse, Camillus, Elbridge, Weedsport, Port Byron, Savannah, Lock Berlin, Lyons, Newark, Palmyra, Macedon, Fairport, Rochester, Churchville, Batavia, Crittenden, Bowmansville, Buffalo, Evans, Angola, Brant, Farnham, Irving, Silver Creek, Sheridan, Fredonia, Brocton, Portland, Westfield, Ripley, North East, Moorheadville, Erie, Girard, Conneaut, Ohio, Ashtabula, Geneva, Unionville, Painesville, Willoughby, Cleveland, Morleys Corners, Elyria, Oberlin, Wakeman, Norwalk, Monroeville, Belleville, Clyde, Fremont, Bradner, Portage, Napoleon, Ridgeville, Archbold, Bryan, Edgerton, Ohio, Butler, Ind., Kendallville, Wawaka, Ligonier, Benton, Goshen, Elkhart, Mishawaka, South Bend, New Car-"The Bootjack" road fork, Rolling Prairie, Michigan City, East Gary, Miller, Aetna Station, Calumet, East Chicago, South Chicago, Chicago, Maywood, Lombard, North Glen Ellyn, West Chicago, Geneva, DeKalb, Creston, Rochelle, Ashton, Dixon, Sterling, Morristown, Unionville, Fulton, Lyons, Clinton, Iowa, Dewitt, Grandmound, Wheatland, Lowden, Mechanicsville, Mount Vernon, Marion, Cedar Rapids, Belle Plaine, Chelsea, Tama, Montour, Legrand, Marshalltown, Le-moille, Nevada, Ames, Boone, Ogden, Grand Junction, Jefferson, Glidden, Carroll, West Side, Vail, Denison, Marion, Dunlap, Woodbine, Logan, Missouri Valley, Council Bluffs, Neb., Waterloo, Fremont, Ames, Omaha, North Bend, Schuyler, Richland, Columbus, Duncan, Silver Creek, Clarke, Central City, Chapman, Grand Island, Alda, Wood River, Shelton, Gibbon, Kearney, Elm Creek, Lex-ington, Willow Island, Gothenberg, North Platte, Sutherland, Paxton, Ogallala, Brule, Bigspring, Julesburg, Red Lion, Sterling, Brush, Fort Morgan, Weldon, Goodrich, Orchard, Kersey, Greeley to Denver.

Vols. 2, 1, 4, 5 and 7 of the Automobile Blue Book contain complete running directions for this trip.

Henrietta, Tex.—Hannibal, Mo.

Henrietta, Tex.—Editor MOTOR AGE—What route shall I take from here to Hannibal, Mo.? Give mileage between towns.—K. N. Hapgood.

From Henrietta the route follows Wichita Falls, Burkburnett, Randlett, Okla., ton, Fort Sill, Apache, Anadarko, Verden, Pocasset, Union, El Reno, 170 miles, Packingtown, Yukon, El Reno, 34 miles, Yukon, Packingtown, Oklahoma City, 34 miles, Depew, Bristow, Kellyville, Sapulpa, Bowden, Red Fork, Tulsa, 109 miles, Collinsville, Claremore, Sequoyah, Bushyhead, Chelsea, Catale, Venita, Miami, Commerce, Lincolnville, Baxter Springs, Kan., Lowell, Galena, Joplin, Mo., 143 miles, Galesburg, Nashville, Liberal, Brenaugh, Moundsville, Nevada, Horton, Arthur, Rich Hill, Butler, Adrian, Archie, Harrisonville, Kansas City, 179 miles, Independence, Levasy, Wellington, Lexington, Waver-Pass, Marshall, Arrow Rock, Booneville, ferry across Missouri River, New Franklin, Rocheport, Columbia, 164 miles, Mexico, Perry, New London, Hannibal. We are unable to give the mileage from Columbia to Hannibal.

Vol. 7 of the Automobile Blue Book published by the Automobile Blue Book Pub. Co., 910 South Michigan Avenue, Chicago, contains full running directions from Henrietta to Columbia.

Mass. Passes Tape-Measure Law

Massachusetts Motorist May Pass Loading Cars Within Prescribed Limits — Other Measures

B OSTON, Mass., June 23—The Massachusetts legislature got through its work a few weeks ago, and now the secretary of state has the various motor laws ready for inspection. Out of some fifty measures presented to the legislature there were but a few that received any great consideration. Through the activity of the Massachusetts State A.A. and the Bay State A.A. the pernicious bills were killed off.

The most important bill to go through was one providing that the driver of a motor car must keep 8 ft. away from the steps or running board of a street car which has stopped to take on or let off passengers. Although it is in force now it is being disregarded day after day in the various cities. It took out the provision that a motorist would have to stop, if necessary. Now under the law there is more chance for accidents, as a driver may swing around a car at a good clip where there is presumably 8 ft. It is known as "the tape measure law."

Another law, or rather amendment to the motor law, struck out the provision requiring a driver to notify the highway commission of an accident where property was injured. Now it reads that only where

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a person is injured. So a driver may knock over a house, bowl an electric light pole down, etc., kill a horse or other animal, but so long as no person is injured the highway commission will be none the wiser. The motor organizations did not favor it in this wide sense, but they did favor a bill to cut out the trivial accident reports.

The light law was amended so as to apply to sleighs. In the old law it called for lights on all vehicles on wheels. Sleigh owners were not compelled to carry a light. Now they are in the same class with other users of the highways. A resolve was passed to have the highway commission investigate what is a good method of compelling owners of cars to carry some form of indemnity bond to cover injuries to people. So many owners now carry a mortgage upon their cars that when a person is injured there is no chance to recover; and the insurance laws do not allow for recovery always, the injured having to get what he can from the owner.

A law in the interests of safety was passed requiring all cities and towns to put up warning signs near railroad crossings. The railroad companies are to furnish the signs. They will be of a standard size and color. Finally a law to prevent

joy-riding in cars owned by the state was passed, providing that the cars must be marked in large letters, "State of Massachusetts" and also an account must be kept of the trips and the cost of fuel, oil, etc.

There were some big fights on a couple of measures, however, and these were defeated. One called for a road test for every operator of a car in the state. This bill had some strong supporters and there were several hearings. It finally was reported and passed one branch but was killed in the other. Another big fight was to create a separate motor vehicle commission. Finally a bill was reported for a deputy commissioner, to be under the highway commission. It passed the Senate but was killed in the lower branch.

There was much antagonism manifested toward the measures favored by the highway commission this year, and a lot of road bills put in by that body were killed. The legislators were sore at the commission because of some contracts, which were let without advertising, and some of the members said some strong things about the makeup of the body. It would not be surprising if later on the makeup of the commission were changed.



The bug bear of all through motor traffic from north to south sides of Chicago—approach to Rush street bridge. The "S" turn impedes free movement. Michigan avenue narrows three blocks from this point and the effect is that of a reducer in a waterpipe.

At the immediate right is the site of old Fort Dearborn, nucleus from which Chicago grew

How to Get a Job in Car Factory

By Allen Sinsheimer

IOW can I get work in the motor industry? How can I apply In for a position? What qualifications are demanded? What wages may I expect?

These are questions asked daily by men everywhere who are anxious to work in the motor industry. Following are the questions most frequently asked, with answers gathered from many car and parts makers for the benefit of those seeking motor car factory or office employment. They display the general qualifications, positions, wages, methods of applying for work and other important information.

The majority of factories have organization plans arranged with the stockholders and directors at the head, the president, the general manager and assistant general manager next in the order named, and all of these comprise the executive or administrative division, which controls the

Accounting department

Engineering department

Production department

Sales department

These in turn control many minor divisions, which are

1-Accounting department.

- a-Bookkeeping
- b-Cashier
- c-Ordering

2—Engineering department

- a-Experimental
- b-Designing
- c-Laboratory testing
- d-Investigation
- e-Drafting

3-Production department

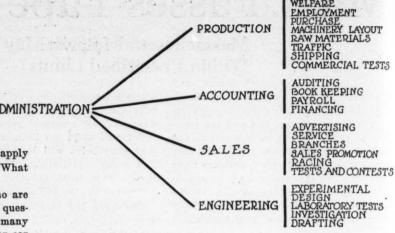
- a-Labor, including welfare, time-keeping and employment divisions
- b-Purchasing department
- c-Machinery layout
- d-Raw material supplies
- e-Traffic
- f-Shipping
- g-Commercial tests

4—Sales department

- a-Advertising
- b-Service
- c-Branches
- d-Agencies
- e-Sales promotion, including racing, tests, etc.

There is always room for a limited number of workers in the motor industry. At present 225,000 men are engaged in the industry in Michigan and Toledo, Ohio, and 15 per cent, or 33,000, leave or are discharged from their positions every month, which creates opportunity for others.

Every company has its own plans for employing workers. In many personal applications are desired; others demand application by letter. Some employ practically every worker through the employment department, while others hire factory employees through the employment department, sales employees through the sales department, bookkeepers through the auditing department and se forth.



Outline of the average factory layout, showing different departments and their connections with the administrative division

Many concerns demand machine shop, garage or motor car school training for factory work, while others make no stipulations. Some require that the applicant be a resident of the city in which the plant is located, while others are willing to take men from other cities.

Wages vary slightly. Salaries range from \$2.50 to \$5 a day for unskilled labor based on an hourly scale of from 25 cents to 621/2 cents. Skilled workers are paid higher amounts, according to their ability and experience.

There are several motor car and parts makers in Michigan and Ohio. These have been asked the following questions, which are frequently asked of MOTOR AGE by readers. The answers selected from some of the larger concerns give a definite knowledge of the employment conditions and requirements.

1-Must I be a resident of the city in which the factory is

Ford Motor Co., Detroit Willys-Overland Co., Toledo, Ohio Buick Motor Co., Flint, Mich. Studebaker Corp., Detroit Chalmers Motor Co., Detroit Hudson Metor Car Co., Detroit Packard Motor Car Co., Detroit Saxon Motor Car Corp., Detroit Olympian Motors Co., Pontiac, Mich. Briscoe Motor Corp., Jackson, Mich.

No. No. No. No.

Residents are given preference.

Yes. No.

Yes.

Preferably, yes; but non-residents of ability also are acceptable.

Milburn Wagon Co., Toledo, Ohio Continental Motor Corp., Detroit The Auto Body Co., Lansing, Mich. Master Carburetor Co., Detroit Detroit Lubricator Co., Detroit

No. No. No. Not necessarily, but preference given to residents of Detroit, which fact indicates more likelihood of permanent em-

2-Must I make application in person?

Ford Motor Co.

In most cases we demand application in letter form, mailed directly to the employment office.

ployment.

Willys-Overland Co. Buick Motor Co. Studebaker Corp. Chalmers Motor Co. Hudson Motor Car Co. Packard Motor Car Co.

Not in all cases. No. No.

No.

les.

Yes.

Saxon Motor Car Corp. Olympian Motors Co. Briscoe Motor Corp.

Detroit Lubricator Co.

Much preferred. Preferably. It is our rule that all applicants appear

in person. Milburn Wagon Co. Yes. Continental Motor Corp. 1 es. The Auto Body Co. Yes.

Master Carburetor Co. Yes.

Yes.

3-Must I have garage or machine shop experience?

Ford Motor Co. Willys-Overland Co. Buick Motor Co.

Studebaker Corp. Chalmers Motor Co. Hudson Motor Car Co.

Packard Motor Car Co. Saxon Motor Car Corp. Olympian Motors Co.

Briscoe Motor Corp.

Milburn Wagon Co. Continental Motor Corp. The Auto Body Co. Master Carburetor Co. Detroit Lubricator Co.

Preferably, yes. No.

Not if you are quick to learn and can think, act and judge for yourself. No. We prefer to teach the men.

Yes, if seeking work in the machine shop. Not necessary, since there are many po-sitions in a motor car factory that do not require experienced men.

Any mechanical experience is an aid. Preferably, but not necessarily if willing

to begin under instruction.

Experience in these lines enables us to give a slightly higher rates to those seeking employment.

No, but preferable. No. No.

For position in service department, yes. Very valuable. Aids in making carbureter assemblies or service men.

4-Must I have training from a motor car school?

Ford Motor Co. Willys-Overland Co. Buick Motor Co.

Studebaker Corp. Chalmers Motor Co.

Hudson Motor Car Co.

Packard Motor Car Co. Saxon Motor Car Corp. Olympian Motors Co. Briscoe Motor Corp.

Milburn Wagon Co. Continental Motor Corp. The Auto Body Co. Master Carburetor Co.

Detroit Lubricator Co.

No.

Not necessary, but helpful in some departments.

Not essential. No, but it is quite a help to a young man who wishes to enter the motor industry. If you desire to do assembling or motor

repair or tuning, yes.

No. No.

Motor car school students are given a slight preference, but begin at beginners' rates.

No. No.

Not necessarily.

This training from a good school gives a man a decided advantage.

5-What salary shall I expect?

Ford Motor Co.

Depends on ability-whether or not a tradesman of the kind needed-general skill. The Ford company pays beginners 34% cents an hour and places them on a probationary basis for six months. If in that time they have eliminated all evil habits and inaugurated clean home life as dictated by an advisor of the company, they are given an additional salary in the form of a share of the profits, amounting to 28 cents, making a total of 621/2 cents, or \$5 a day. This

Willys-Overland Co.

Buick Motor Co.

Studebaker Corp. Chalmers Motor Co. wage is for unskilled workers. Skilled men are given higher wages, according to ability.

Depends entirely on ability.

Depends on ability by showing what you can do.

Twenty-eight cents an hour up.

Based entirely on qualifications.

for ourselves his ability.

Most machine and assembly jobs are piecework. Pieceworkers making from \$2.50 to \$5, depending on their ability and speed. The hour rate is computed according to the applicant's experience. About 34 cents an hour is the average.

Salary is specified after we have inter-

Depends on applicant's experience and

Twenty-five cents an hour is the mini-

viewed the applicant and determined

Hudson Motor Car Co. Packard Motor Car Co.

Saxon Motor Car Corp. Olympian Motors Co. Briscoe Motor Corp.

Milburn Wagon Co.

Continental Motor Corp. The Auto Body Co.

Master Carburetor Co. Detroit Lubricator Co.

Regulated by ability.

Depends on position filled. Average rate for kind of work performed.

-What are the qualifications essential to work in the accounting department?

Market price.

ability.

mum.

According to ability.

Ford Motor Co.

Buick Motor Co.

Chalmers Motor Co. Hudson Motor Co. Saxon Motor Car Co.

Olympian Motors Co. Briscoe Motor Corp.

Milburn Wagon Co.

Thorough knowledge of office work, good penmanship, strict application, honesty. Mathematical accuracy, good penmanship,

knowledge of operation of adding machine, neat appearance. Bookkeeping and clerical experience.

Mathematical experience and ability. Thorough knowledge of accounting and costs.

General accounting experience. Applications for jobs in the accounting department should be made by letter to the assistant treasurer, giving him all details of experience.

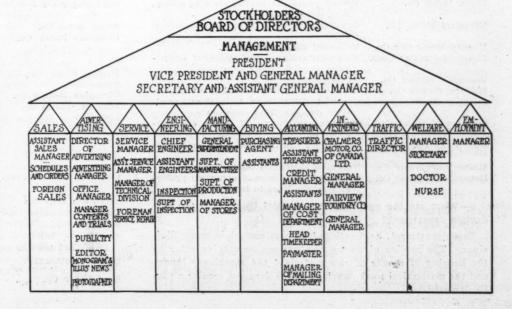
Knowledge of the principles of at least bookkeeping; must be rapid; accurate at figures; must have an analytical mind that will enable one to see beyond whatever information is directly before him; must have the ability to compile statistics and graphs that will convey necessary information to his superiors in a logical and intelligent manner: also the ability to convey verbal information clearly and concisely.

Continental Motor Corp.

Must be clear headed, accurate at figures and persistent in following to a conclusion any line of accounts.

Knowledge of accounting. The Auto Body Co.

MANY of the inquiries in the im-Mense volume of letters Motor Age receives from readers are on the subject of this story—how to get a job in motordom. In these few pages an attempt is made to cover the field of job-hunting in the industry for the benefit of these who seek such employment. While all the makers are not represented here—it would be impossible to do so in one issue—this can be taken as a correct analysis of the situation and well might be considered an encyclopedia of its kind. If you are interested in employment by makers of motor cars or parts, keep it and use it. The diagram is that of the organization of the Chalmers Motor Co., and will give you some idea of the opporfunity for jobs that exists in industry.



Master Carburetor Co.

Experience in a position similar to that wanted. Record must show employment by one concern of considerable length of time.

Detroit Lubricator Co.

Accurate clerical experience. Personality is a factor.

7-What are the qualifications essential to work in the engineering department?

The engineering department comprises a chief engineer, assistant engineers, investigators, draftsmen, chemists and experimental engineers. This work calls for technical engineering knowledge and training.

The Ford Motor Co.

Technical training along lines followed, practical experience, initiative, and so

Willys-Overland Co.

Previous drafting or engineering experience.

Buick Motor Co.

Mechanical drawing, mathematical ability, technical experience. Drafting experience necessary. Techni-

Chalmers Motor Co. Hudson Motor Car Co.

cal experience desirable. This department requires draftsmen with considerable experience, chemists, de-

Saxon Motor Car Corp.

signers, gas engine experts.

Technical training, practical experience to a greater or lesser degree.

Olympian Motors Co. Milburn Wagon Co.

Experience required. Drafting experience, general engineering knowledge, knowledge of materials, mathematics, technical education very desirable, but not essential; ability to think logically; inventiveness or originality.

Continental Motor Corp. Being qualified as a practical draftsman and able to calculate distribution or stresses and strains and value strength in material and practical application.

The Auto Body Co.

Must be draftsman, have motor car bodybuilding experience.

Master Carburetor Co. Detroit Lubricator Co.

Technical education. Drafting and designing experience, speed and clerical exactness.

8-What are the qualifications essential to work in the experimental engineering department?

This department is comprised of engineers whose duties are along experimental lines. They experiment with all makes and models of cars to discover what advantages other cars possess which might be incorporated in their own cars and experiment with defective springs, defective ignition, etc., to determine the best way to overcome the faults of their car. This work demands a technical education and experience of high degree.

Ford Motor Co.

Long service, mechanical ability, honesty, technical and mechanical knowledge and established general dependability.

Willys-Overland Co. Buick Motor Co.

No applications from outside considered. Inventiveness, mechanical drawing ability, mathematical ability.

Chalmers Motor Co.

General mechanical and motor car experience. Technical college education.

Hudson Motor Car Co. Saxon Motor Car Corp.

Technical training and practical experi-

Olympian Motors Co.

ence. Experience.

Milburn Wagon Co.

Technical education desirable but not essential. Must have wide shop knowledge and repairing experience.

Continental Motor Corp. Practical knowledge of motor car con-

struction. Must know drafting and body work gen-

Auto Body Co.

erally.

Master Carburetor Co.

Technical education in its line. Detroit Lubricator Co. Technical and practical education preferably in the lines to be undertaken.

9-What are the qualifications essential to work in the production department?

This department, as mentioned before, comprises many divisions. The replies given by the various companies refer to the keeping of stocks of raw materials, the machinery layout and the mechanical work, much of which does not require a particular skill.

Ford Motor Co. Willys-Overland Co.

Machine shop experience preferred. No previous experience required.

Buick Motor Co. No experience required but must be able to think and act and judge for yourself.

Chalmers Motor Co. To possess experience in the particular line applied for.

Depends on the line of work the applicant Hudson Motor Car Co. desires.

Mainly good health and ambition. Saxon Motor Car Corp. Olympian Motors Co. Must have mechanical experience to get

best wages. Experience in whatever line desired. Briscoe Motor Corp.

Milburn Wagon Co. Knowledge of blue prints, good memory, initiative, ability to follow a task through to completion regardless of obstacles, grasp of details, content to hold minor position to become familiar with manufacturing, stick-to-itiveness, health.

Continental Motor Corp. Health, good character, physical strength. Must be mentally capable of comprehending instructions and skillful in their

application. Knowledge of its business. The Auto Body Co. Master Carburetor Co. Experience mechanically.

Shop experience coupled with clerical ex-Detroit Lubricator Co. perience.

10-What are the essentials required in the purchasing department?

Good clerical experience, penmanship, Ford Motor Co. neatness, good address and ability to

meet all classes of people. Buick Motor Co. Good judgment, initiative, good at figures and grammar and of neat appearance.

Chalmers Motor Co. Knowledge of motor car parts, accounting or clerical experience.

Any good, wide-awake young man can Hudson Motor Car Co. work in the purchasing department. Knowledge of sources of supplies, good Olympian Motors Co.

business judgment and keenness. Experience in purchasing department work Milburn Wagon Co. desirable but not absolutely necessary. Should be accurate and quick with figures, however, and familiar with stock record work and also have some knowledge of bookkeeping to be able to handle the vouchering of invoices and make

proper distribution to the different accounts. Continental Motor Corp. 'A capacity to realize current values and

market conditions. The Auto Body Co. Knowledge of business and general ability. Master Carburetor Co. Experience in that line.

Detroit Lubricator Co. Manufacturing experience and thorough understanding of product requirements. clerical exactness.

11-What are the qualifications essential to work in the traffic department?

Ford Motor Co. Traffic experience, aggressiveness, clerical ability, honesty, etc. Buick Motor Co. Railroad geography and routing.

Chalmers Motor Co. Freight and express rates, railroads, etc. Clerical and stenographic experience is helpful.

Hudson Motor Car Co. Saxon Motor Car Corp. Olympian Motors Co. Milburn Wagon Co.

Must have railroad experience. Familiarity with railroad methods. Experience necessary.

Knowledge of rates, routes, handling of claims, interstate commerce law and rulings, classification of shipments, rates to apply, correct length of car to use on each carload shipped; keep in close touch with every other department.

Clerical exactness and training.

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Continental Motor Corp. Knowledge of railroad methods and practices and freight schedules.

The Auto Body Co. Must have traffic experience. Railroad experience, clerical, is valuable. Detroit Lubricator Co.

12-What are the qualifications essential to work in the shipping department?

Good wide-awake hustlers, not necessarily Ford Motor Co. of any previous experience.

June 28, 1917 Classification of freights and freight rates. Buick Motor Co. Chalmers Motor Co. Clerical experience, knowledge of methods of handling freight and express shipments. Railroad experience. Hudson Motor Car Co. Familiarity with railroad methods. Saxon Motor Car Corp. Ambition and experience preferably, but Olympian Motors Co. experience not absolutely necessary. Milburn Wagon Co. A thorough knowledge of routes, ability to obtain equipment to move goods when ready, general knowledge of classification, knowledge of railway requirements as to packing goods for domestic and export shipment, ability to follow orders through until shipped. Continental Motor Corp. Knowledge of railroad methods and practices and freight schedules. Accuracy, hustle and knowledge of traffic. The Auto Body Co. Master Carburetor Co. Honesty and ability to follow orders carefully. Physical fitness and clerical exactness. Detroit Lubricator Co. 13—How can I get to be a factory tester? Ford Motor Co. By working along lines leading to that end, such as repairing, etc., and by strict application to whatever duties set at. Willys-Overland Co. All-round mechanics only considered. The testers must have experience in driv-Chalmers Motor Co. ing, tuning motors, general repair work, etc. Hudson Motor Car Co. By working as a tester helper or handy man in test department. Packard Metor Car Co. By thorough training and through promotion. Must first have full knowledge of gasoline Saxon Motor Car Co. engine. Olympian Motors Co. Must apply in person. Must be experienced drivers and have a Briscoe Motor Corp. very thorough knowledge of the construction of the car. Experience in all branches of motor car Milburn Wagon Co. work necessary. If applicant qualifies, he is assigned to testing immediately. If not, must be trained. Continental Motor Corp. Start as a helper. By proving ability in that line. Master Carburetor Co. Detroit Lubricator Co. Experience and education. 14-What are the qualifications essential to road testing work? Thorough motor car mechanic. Willys-Overland Co. Must be thoroughly familiar with engine Buick Motor Co. and starter troubles and be careful. Chalmers Motor Co. Knowledge of gasoline engine, carbureter, ignition and driving experience. Must be good driver and repair man. Hudson Motor Car Co. A thorough knowledge of the work and Packard Motor Car Co. driving experience. Experience necessary. Olympian Motors Co. These men generally are transferred from Briscoe Motor Corp. some other portion of factories. A thorough knowledge of all mechanical Milburn Wagon Co. parts of the car. Detroit Lubricator Co. Education in that branch of the trade.

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15-What are the qualifications essential to work in the sales

This question applies only to employment as salesmen either in a branch or agency or the main sales offices.

Thorough knowledge of the article to be Ford Motor Co. sold, good address, courtesy, honesty, general dependability, etc. Buick Motor Co. Good appearance, pleasing manner and knowledge of the principles of selling-a good mixer.

Chalmers Motor Co. Sales ability and general motor car experience, stenographic or clerical experiHudson Motor Car Co. Must know all about a car, have neat appearance and a good personality. Saxon Motor Car Corp. Sales ability, diplomacy and a good judgment of human nature. Olympian Motors Co. Natural salesman, preferably with motor car experience. Milburn Wagon Co. Enthusiasm. Continental Motor Corp. Ability to close deals. Master Carburetor Co. Knowledge of salesmanship. Must know about carbureters and ignition.

16-What are the essential qualifications to work in the advertising department?

This is the department which cares for the writing and placing

of advertising, house organs and so forth. Ford Motor Co. Knowledge in advertising lines, experience, and alertness. Buick Motor Co. Good knowledge of the English language and grammar, principles of selling, printing and engraving methods also valuable. Chalmers Motor Co. Experience along the following lines is helpful, newspaper, stenographic, clerical and general business. Hudson Motor Car Co. Must have experience. Olympian Motors Co. Advertising and motor car experience.

17-What are the qualifications essential to work in the service department?

This is a section of the sales department, and in many concerns the employment of men for this division is made by the sales department, while in others it is handled by the employment. Service departments are maintained by factories to supply parts and making repairs and adjustments for car owners and car dealers.

Ford Motor Co. General knowledge of the Ford car is necessary, with repair and parts knowledge and clerical ability. Apply to employment superintendent. Willys-Overland Co. Apply to L. A. Miller, office manager. Buick Motor Co. Must be thoroughly familiar with engine and starter troubles and must be careful Chalmers Motor Co. General motor car experience.

Hudson Motor Car Co. Must be good mechanic and correspondent. Saxon Motor Car Corp. Must be engine builder and clerical. Olympian Motors Co. Clerical and mechanical. Briscoe Motor Corp. Must be first-class repair man, have own tools and must know courtesy and respect, since much of this work is done with our customers. Milburn Wagon Co. Diplomacy or tact in handling people,

thoroughness, ability to devise temporary repairs if needed. Road service men are taken usually. Continental Motor Corp. Knowledge of service work and training. Master Carburetor Co. Knowledge of carbureters and ignition. Detroit Lubricator Co. Gasoline engine education and knowledge

18-How can I become a factory racing driver? How can I get on a factory racing team?

of ignition.

Very few of the motor car makers are operating racing teams now. Those who do are extremely careful and particular about the men they employ and prefer individuals who already have attained a reputation or have long mechanical experience. For example, the Hudson Motor Car Co., which is one of the very few companies operating racing teams, states that it employs only such men for racing work who are expert mechanics and that all other applicants have no chance whatsoever. It requires at least four years to become an expert mechanic. The same applies to racing drivers. Only racing drivers of reputation or men who have gained experience working with racing drivers are employed.

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Electrical Equipment of the Motor Car -



By David Penn Moreton & Darwin & Hatch.

Editor's Note—Herewith is presented the forty-ninth installment of a weekly series of articles begun in Motor Age issue of June 29 designed to give the motorist the knowledge necessary to enable him to care for and repair any and all of the electrical features of his car, no matter what make or model it may be. At the conclusion of this series, "Electrical Equipment of the Motor Car," with additions, will be published in book form by the U. P. C. Book Co., Inc., in a size to fit the pocket conveniently.

Part XLIX—Ammeters

A VERY simple form of ammeter is shown diagrammatically in Fig. 277. M is a strong permanent magnet with its ends mounted inside the coil C through whose turns the current to be measured passes, connection to the coil C being made by means of the terminals T 1 and T 2. A small piece of soft wire, I, is mounted on a vertical shaft, P, which also carried a pointer, P 1, with a balance weight, W. The balance weight provides a means of making the instrument read the same in any position. The magnetic action of the magnet M on the piece of soft wire is such that the piece is held in the position shown in the figure when there is no current in the coil, that is, it is held in a position corresponding to the direction of the magnetic field from the north to the south magnetic poles of the permanent magnet.

The direction of the magnetic field due to the permanent magnet is from left to right. If a current of electricity be sent through the coil C, a magnetic field will be produced around the coil, and the direction of the magnetic field inside or outside the coil may be determined by the following simple rule. When you look along a conductor in which there is a direct current, in the direction of the current, the magnetic current surrounding this conductor due to the current in the conductor will be clockwise in direction. Let us assume that the direction of the current is toward the paper in the wires shown in the left-hand cross section of the coil. With the current in the coil in this assumed direction, there will be a magnetic field about the left-hand cross section in a clockwise direction, or down through the center of the coil, and at the same time there will be a magnetic field about

the right-hand cross section in a counter-clockwise direction which also will be down through the center of the coil. This magnetic field which the current in the coil tends to produce cannot exist alone but combines with the magnetic field of the permanent magnet and forms a resultant magnetic field. These two magnetic fields may be thought of as two forces whose directions and values are shown diagrammatically in the small figure to the right.

The line marked Fm represents the magnetic field due to the magnet and its direction is toward the right as shown by the arrowhead. The line marked Fc represents the magnetic field due to the current and its direction is down and at right angles to Fm. The lengths of the two lines represent the values of the fields to some convenient scale. The line R represents the resultant field, due to Fm and Fc, both in direction and in value to the same scale as Fm and Fc. The piece of iron, I, will move so that it is parallel to the direction of the resultant magnetic field, which results in the pointer P 1 being moved toward the right over the graduated scale at the top of the instrument. The amount of the deflection of the pointer P from the zero position will depend upon the position of the resultant field R in relation to the field Fm, due to the magnet. The angle between R and Fm, of course, will depend upon the value of Fc, which in turn depends upon the size of the coil, the number of turns in the coil and the current in the coil. Now by properly adjusting the size of the coil and the number of turns, the value of Fc may be made such that when it is combined with Fm to form R, the angle be-

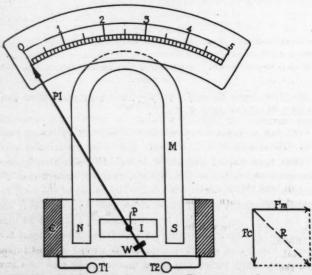


Fig. 277—Simple form of ammeter. This type can be used in measuring direct current only

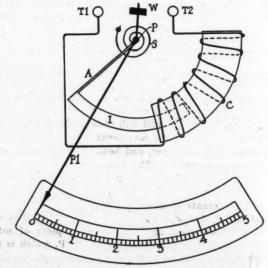
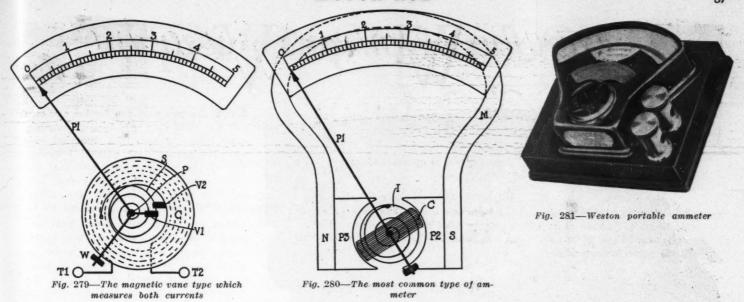


Fig. 278—Plunger type of ammeter. This type can be used for either direct or indirect current



tween Fm and R will be of the desired value. For example, the constructions may be such that 5 amp. in the winding of the coil will produce a deflection, or movement, of the pointer P from zero to the extreme right of the scale.

The position of the pointer P for various known currents in the coil may be marked, and after such a marking is made the instrument may be used for measuring electrical currents. If the number of turns in the coil be reduced in value to half, then the current of the amperes will be required to produce the same deflection of the pointer as originally was produced by a current of 5 amp. The markings on the scale then would have to be charged to twice their present value. If the number of turns in the coil be increased to five times their present value, then only 1 amp. would be required to produce a deflection of the pointer from zero to the extreme right hand ends of the scale. Thus, the current the instrument is capable of indicating will depend upon the turns in the coil C. This type of instrument sometimes is called the wiring iron type. The direction of the deflection of the pointer from zero in an instrument of this kind will depend upon the direction of the current through the winding in the coil C, so that the current in C always must be in one particular direction if the pointer is to be deflected in a definite direction from the zero mark on the scale. Such an instrument can be used in measuring direct current only.

The instrument shown diagrammatically in Fig. 278 is known as the plunger type. It consists of a curved soft iron plunger, I, mounted on the end of an arm which is carried on the shaft P. A pointer, P, and a balancing weight, W, also are mounted on the shaft P, and the whole system is held in a definite position by the coil spring S. When a current is sent through the coil C it magnetizes the soft iron core C, which then is attracted, or drawn, into the core. The movement of the iron core will depend upon the number of series in the coil C, the strength of the spring S and the current in the coil C. The spring and wires in C may be so adjusted that any desired current will produce a movement of the end of the pointer from one end of the scale to the other. Changing the series in the coil will change the value of the current required for a complete movement of the pointer from one end of the scale to the other, and hence the current capacity of the instrument is changed. The deflection of the pointer in an instrument of this kind is in the same direction regardless of the direction of the current, and such an instrument may be used in measuring an alternate or direct current.

The instrument shown in Fig. 279 consists of a coil of wire, C, wound on a hollow spool inside of which a piece of soft iron, V 1, called the vane, is mounted on a shaft, P, which is parallel to the axis of the coil but does not correspond in position with the center of the coil as shown in the figure. A second piece of soft iron, V 2, is mounted on the inside edge of the opening of the coil and in about the same relation to V 1 as shown in the figure.

The moving parts are balanced by the weight W, and the system is held in its zero position by the spring S when there is no current in the coil. When there is a current in the coil, the two pieces of wire are magnetized alike in polarity, both north poles at the upper end and both south poles at the lower end, or vice versa. The two pieces then will repel each other, which will cause the pointer to move over the scale. The field inside the coil is somewhat stronger near the outer edge, and the piece of iron V 1 is acted upon by a force tending to draw it into this stronger field, which will be the result as the moving system rotates, due to the shaft P being off the center of the coil. These two forces on the piece of iron V 1 combine to produce a movement of the pointer which will vary in value with the current in the coil and the number of turns. The direction of the deflection of the counter from zero is independent of the direction of the current in the coil, and the instrument may be used in measuring both direct and alternating currents. This kind of an instrument is known as the magnetic vane type.

Most Widely Used

The instrument shown in Fig. 280 is the most widely used of the various instruments operating upon the magnetic effect of an electric current. It consists of a permanent magnet, M, provided with two special hole pieces, P 1 and P 2, between which a cylindrical piece of soft iron, I, is mounted. A coil, C, is wound on a light aluminum frame and pivoted at the top and bottom so that it may rotate about the piece of iron I, the sides of the coil moving in the small gap between I and the pole pieces P 1 and P 2. The current is led into and out of the coil C by two spiral springs, one at the top and one at the bottom, which also serve to keep the coil in its zero position and to provide a restoring force against which a magnetic action of the current in the coil is to act.

A pointer, or needle, is attached to the coil and wired over a suitable scale when there is a turn in the coil. In instruments of this kind the wire used in winding the coil is very small and capable of carrying only a very small current. In measuring larger currents than the coil will carry safely use is made of what is called an ammeter shunt, which will be explained in one of the following sections.

When a current of electricity is sent through the coil of the instrument shown in Fig. 280, a magnetic field is produced through the coil, and this magnetic field and the one due to the permanent magnet tend to turn so that they are parallel to each other. Since the coil is free to turn, except for the action of the springs attached to it, there will be a movement of the coil, and the extent of this movement will depend upon the value of the current in the coil. The direction of the deflection of the coil will depend upon the direction of the current in the coil, and hence the instrument can be used only in measuring direct current. A Weston portable ammeter of this type is shown in Fig. 281.

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Canadian women are driving ambulances in France. Those who are pictured here are only a few of the many in Red Cross Service abroad

Women Prove Motor Value at Home

WHEN the women of America first organized for service as drivers of motor cars, and trucks or ambulances, if necessary, the common opinion was that they had organized in vain. No ambulance work. No emergency driving. This opinion did not hold good long, however. Divers opportunities have arisen or been made for the exercise of the new driving ability women who motor have acquired, and the recruiting activities and war preparations in general are that much better off for them. Add to these opportunities the growing sentiment that Europe even may see American women at wheels of American ambulances instead of the many college men who are going abroad for that service, and the women who organize for driving motor vehicles in service are no longer considered to organize in vain.

Members Register

Members of the Emergency Drivers' League in Chicago have registered at a state meeting with the woman's committee of the Council of National Defense as ready for service. Two classes of motor service are open to them. The women who own cars can donate them to the government for part time use or can offer themselves as drivers. Most of those who have registered for personal service have been driving their cars in regular daily government work for several months.

This organization co-operates with the Council of National Defense, and its members belong to the Navy league. Under the chairmanship of Miss Florence Spofford about seventy-five women have been donating their services as drivers wherever the authorities have needed them. They have been meeting weekly at formal classes in driving under expert instruction and getting all the actual experience they can meanwhile.

Among the motor services being rendered by women in Chicago, and in other cities as well, are in recruiting for the navy, transporting supplies for the Red Cross, carrying light office fixtures for the recruiting offices, taking sick or injured jackies and soldiers to hospitals and providing a direct line of communication between various army headquarters. The calls are so numerous the Navy league is conducting a recruiting campaign of its own for more cars and drivers.

Mrs. Henry Crean, a sister of Colonel William Nicholson, commandant of the Fort Sheridan training camp, is to drive a motor car in Paris, delivering supplies from the depot to the various hospitals. Other Chicago women are doing the same thing. It is said at the Chicago offices of the Red Cross that American girls who can drive cars are giving most valuable service to the Red Cross service in this way in Paris and other French cities.

Your Food Bit

DRESIDENT WILSON is credited with saying that our plain duty is Food Production and Food Conservation. Her-

bert C. Hoover goes even further and tells how this plain duty is to be done. Among other things he says that true food conservation cannot come without conservation of the wheat supply, first that the United States may benefit by that conservation and, second, that the Allies, France in particular, may benefit by it.

That MOTOR AGE readers may know the possibilities of meals without wheat bread, these columns are to contain menus in which bread other than wheat is used. And since the appeal sent out by the Housewives' Army of National Defense contains not only conservation of wheat but conservation-with reason-of food in general, the first to appear here are from that appeal. They are divided into a day's menu for men and a day's menu for women, both being based on the balanced, calorie, ration necessary for men and women of average activity and in muscular work. Rye flour, cornmeal, oatmeal, rice, potato, bran, etc., may be substituted for the ordinary soda biscuit of wheat.

The Man's Menu

Breakfast:

Oatmeal, 2 h. tbsp.

1 cup coffee, 1/4 c. milk, 1 tsp. cream,

2 cubes sugar

2 boiled eggs 1 slice brown bread

Lunch:

Macaroni, baked with cheese, 2 h.

thsp.

1 soda biscuit

1 glass milk

Large baked apple

Dinner:

Corn puree, 4 oz. Roast leg, 1 slice

Boiled potato

Spinach, 2 h. tbsp.

Mince pie, 1/6

The Woman's Menu

Breakfast:

Oatmeal, 1 h. tbsp.

1 cup coffee, 1/4 c. milk, 1 tsp. cream,

2 cubes sugar

1 boiled egg

1 slice brown bread

Lunch:

Macaroni, baked with cheese, 1 h.

tbsp.

1 soda biscuit

2 cups milk

Large baked apple

Dinner:

Corn puree, 4 oz.

1 slice lamb

Boiled potato

Spinach, 2 h. tbsp.

Mince pie, 1/12

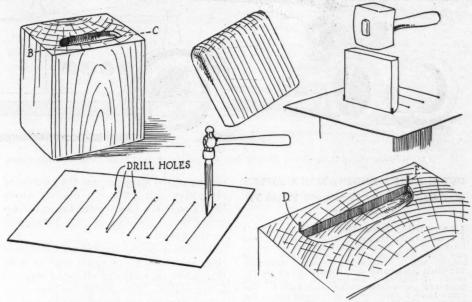
ne Notor ar Depair Shop

Cutting Louvres in Engine Bonnet

LTHOUGH all cars are not fitted with A louvres in the bonnet over the engine, it is sometimes desirable to so equip the car. There is an instrument on the market which cuts these louvres or openings very easily, but the repair man in a small town is not always equipped with special tools of this kind and must resort to other methods. A scheme for this is shown in the accompanying illustration and the tools and other apparatus used are those to be found around any shop. The part requiring the greatest work and accuracy is the cutting out of the wood block to the size and shape of the desired opening in the bonnet. It is best to cut this in the end grain of the block, the latter being large enough so it will not be split. A large chopping block is ideal for this, as it has the necessary rigidity. Cut the top of the block off square so it will have a perfectly flat surface and on this lay off the desired shape of the louvre. With chisel and gouge scoop out the wood to a depth corresponding to the size of the opening in the louvre. The corners of the recess can be rounded with the gouge. The next thing to make is the other part of the wood die, which consists of the hard wood block A, having the same thickness as the width of the cut in the chopping block. The grain in the block A should run as shown and the end which fits in the recess shaped so it will be an exact reverse of the latter, fitting it snugly. By taking off a little here and there with a wood rasp, the block A can be made to fit exactly.

To Lay Off Louvres

The next step is to lay off the louvres in the sides of the bonnet, it being only necessary to draw a series of straight lines, corresponding to the length of the louvres. At each end of these lines drill a very small hole, which will be used to register the openings later on. With a sharp cold chisel cut the metal along the entire length of the lines previously drawn. When this has been done the side of the bonnet will present a series of slots and the next step is to place these slots upon the chopping block in such a way that they will each in turn coincide with the line B-C. This is made possible by driving in two thin brads D and E into the corners of the recess, as shown, cutting off the heads after they are in place. The holes which have been drilled in the ends of the slots in the bonnet fit over the nails D and E, thus making sure that all the openings will be cut uniform and parallel, provided the lines have been drawn parallel. Place the first slot in position on the block and line it up by the nails as before stated. Get a helper to



Shop tools with which louvres can be cut in the engine hood and method of doing so

hold the bonnet in this position and be sure that the metal lies flat on the wood. The block A is now placed above the slot, between the nails and in a vertical position. By striking the upper end of A a few sharp blows with a mallet, the louvre will be stamped out. The same procedure is carried out with all the slots, taking them in regular order. It is obviously necessary to cut the openings in regular order, as otherwise the raised portion of the louvre would prevent the metal from lying flat on the block.

After all the openings have been cut in this way, the ragged edges can be smoothed up with a file and emery cloth. If this smoothing up job is carefully done, the louvres will present a neat appearance and closely rival those stamped out in a press.

Protecting Spare Tires

Over one-half of the cars one sees carry spare tires that are not protected properly when they are strapped on the running board or carried on the rear of the car. In many instances they are carried without covering of any kind and are therefore subjected to dust, oil, mud and water, as well as the destructive influence of light. Perhaps the most serious thing is that water can collect in the spare tire, which will soon soak into the fabric and eventually ruin it. Dust may mix with this water and form a kind of mud which will harden on the inside of the casing. When the tire is used later on, it is very likely that this coating will not be rubbed off, thus exposing a rough surface to the inner tube. This is bound to chafe the tube and the car owner wonders why the tube has given out.

There are many tire covers on the market and the cost of these is so small in comparison to the amount of good that they do, that one wonders why they are not more universally used. When spare tires are strapped to carriers, care should be taken to see that they are held tightly, otherwise they are likely to wear considerably due to the tossing about of the car.

Tire Seal Test

For three days a Buick six-cylinder car equipped with Kelly-Springfield Kant-Slip shoes underwent a test on the roads in the vicinity of New York with a new tire seal inside the inner tubes. The test was made by the Automobile Club of America and showed the compound, which is made by the Crew Levick Co. of Philadelphia, to cause no loss in air pressure during the actual driving time. An examination of the tubes showed the seal in every instance closed the holes made by a pen knife. A chemical test showed that outside of a small quantity of water in the compound there was nothing to shorten the life of the rubber. No decomposition had set in when the compound had been heated to 260 deg. F., which is the point at which it solidified. Oil had no effect, and it was easily washed from the surface of the car. The distance traveled in the test was 292.7

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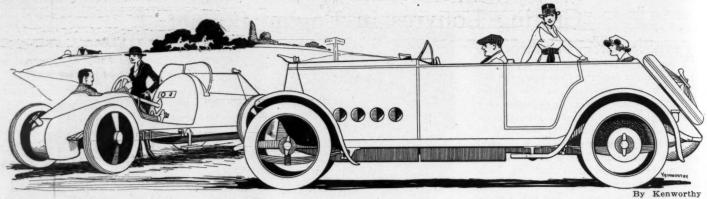


Fig. 1—Two out-of-the-ordinary Motor Age designs for a fast roadster and touring car. Note the novel shapes of the windshields

OVERHAULED ENGINE HAS A KNOCK May Be Caused by Improperly Fitted Piston Rings

HASTINGS, Iowa—Editor Motor Age—I have just taken up the connecting rod bushings and crankshaft bearings from my car and installed non-leaking rings. The motor has a knock at regular intervals. Would it be caused by the new rings on account of improper seating, or is it due to bushings or valves being too tight? The rings have a notch to fit in a small pin in the grooves. Is it possible that they were not installed properly?—J. W. Dolph.

The knock you speak of may be caused by the new rings, or in reassembling the engine you may have gotten the bearings too tight. If the knock is like the tapping of a hammer upon a metallic surface. it is quite likely that the piston rings have not been properly fitted, or that they are not the correct size. For one thing if the ends of the rings are hard butted against one another when the pistons are in place in the cylinder, they may be buckled by expansion when heated.

When the rings are fitted into the grooves of the piston, care must be taken that each ring will be placed into the groove for which it has been previously prepared, either by lapping or grinding. While the rings and grooves look alike, there may be, nevertheless, a slight variation in them and for this reason each ring should be prepared for a particular groove. The ring should be first tried in the groove without slipping it over the piston, by rolling it around the groove. It should fit snugly, as at B, but still be free to slide in and out easily.

At A is shown a case of improperly fitted piston rings, which are likely to set up a series of knocks when the engine is running. As will be noticed there is a space above each ring. When the piston is at the bottom of its stroke, this space will be at the bottom of the groove and as the piston ascends, the rings will be momentarily held stationary until the lower part of the groove will again pick them up and carry them to the top of the cylinder. On the downward stroke, the opposite takes place. This constant hammering of the rings against the grooves of the piston will produce a distinct knock in the engine. The greater the space between the ring and groove, the louder will be the knock.

Another point to remember is that new rings should be given ample time to wear themselves in, plenty of oil being supplied to the engine. If an engine has been fitted with new rings which have not been properly stored, the latter may have become sprung and do not fit the cylinder correctly. In this case the high spots must be removed by grinding or lapping.

OPERATION OF MACOMBER ENGINE Valves Are Actuated in Turn from a Single Cam

Belle Plaine, Iowa—Editor Motor Age—Kindly explain the working principles of the Eagle-Macomber rotary motor, made by the Eagle-Macomber Motor Co., Sandusky, O.

Inquiries Received and Communicatione Anewered

Mons Answered
J. W. Dolph
Oakey SchuchertBelle Plaine, Iowa
Herbert SmeedWalterville, Ore.
William HeinAnsley, Neb.
W. L. RedmonTipton, Mo.
G. H. KohrtColeraine, Minn
H. W. Bacon
J. W. Guy
H. G. DonceyPerry, Okla.
C. F. AllenDoniphan, Mo.
A. L. GrayOttawa, Kan.
C. ZinkanIndianaolis, Ind.

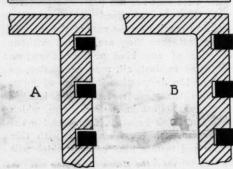


Fig. 2-Correct and incorrect way of fitting piston rings

2—Has this motor proven a success by test?
3—How many r. p. m. will it turn?
4—Will it furnish power as steady as steam?
5—Will this motor be used very extensively in pleasure cars?
6—How many horsepower will a Metz 3% by 4 develop on the belt with an 8-inch pulley?
7—Would this motor give satisfaction as regards nower?

gards power?
8—How many r.p.m. will it turn?—Oakey

1-The Macomber engine is built with either five or any odd number of cylinders, arranged around the main shaft with all parts identically alike, so that the one cam which is provided actuates all the valves in succession and one ignition ring serves for firing all the cylinders. The pistons in this engine are of the conventional type, but the connecting rods are quite different. The latter resemble elongated dumb-bells, one end fitting into a socket in the piston and the other into a socket in what is called the angle plate. The angle plate is disk-shaped and inclined at an angle to the horizontal axis of the engine. The amount of this inclination corresponds to the length of the piston stroke. Thus when the cylinder on top is compressing a charge, which, at the end of its stroke is fired in the usual manner by a spark plug, then, when the explosion

occurs the pressure between the cylinder

and piston tends to force the piston back.

This force acting through the angle be-

tween the plate and the cylinder bases

tends to force the angle plate around. In-

asmuch as the cylinders and angle plate are

geared together, the effect of this impulse

is to revolve the entire engine on its ball

bearings. The pressure from the ignited

gases continues this pushing action until

the cylinder has reached the bottom of the

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swing, when the exhaust valve is opened. The next upstroke of the piston forces out the burnt charge and when this same cylinder is again at the top of the swing, it has been cleared for drawing in a fresh charge. The valves are located in the head of each cylinder and operated by rockers from

a single cam, there being no push rods. The gas travel has been shortened in this engine by mounting the carbureter on the end of the engine supporting shaft. The

gas is fed through a central passage and sucked into the cylinders by centrifugal force. In the same way, the exhaust gases are thrown off by centrifugal force into an annular chamber which serves as a muffler.

2-Some excellent results have been obtained in tests.

3-About 2,800 r.p.m.

4-No. The expansive power of steam is constant to the end of the stroke, whereas this is not so in a gasoline engine.

5-This is hard to say.

6—About 18 hp.

7-Yes, if it is in good shape.

8-Depends on existing conditions.

HIS GENERATOR BURNS OUT LIGHTS Current Evidently Not Going to Battery from Generator

Ansley, Neb.—Editor Motor Age—The storage battery on my 1915 Maxwell tests below 1150, but is still strong enough to spin the motor with ease. However, it burns out the lights as fast as I put them in or else they light very faintly and only when engine is running. The fuse has never burned out; the generator charges at 25 amp.; the regulator is not in good condition; the battery boils over and gets very warm.

1—Would charging at 25 amp. cause the battery to boil over when the test is below 1150?

1150?
2—Would the regulator not working properly cause lights to illumine only when the engine is running?
3—Should the light burn bright if battery still spins the engine?
4—What will cause points to stick on the regulator?—William Hein.

1-We would advise that you take your car to a Maxwell service station, inasmuch as there are a number of small adjustments necessary which only an experienced electrician should attempt. The fact that the car is a 1915 model and that the battery tests below 1150, leads us to believe that the car shows lack of care and therefore is in a run down condition. We believe that unless engine bearings were loose and compression poor, that a battery testing 1150 would be unable to spin the engine sufficiently for starting. The fact that the lights burn out only when the engine is running, indicates that the current from the generator, instead of going to the battery flows directly to the lights, causing them to burn out just as soon as the generator has reached a speed sufficient to generate more current than the lights can stand. If the current were going to the battery the latter would act as a governor, allowing current to flow through the battery and forcing over the light current only in proportion to the resistance of the battery, which when fully charged is not sufficient to burn out the lights. The fact that the generator charges at the rate of 25 amp. is sufficient to cause the battery to boil over. The regulator should be adjusted so that the charge will not exceed 12 to 14 amp.

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2-No. This trouble is more likely caused by a loose connection in your battery positive circuit between the lighting switch and battery, thus preventing the current from the battery from passing over the lights when the engine is not running. This prevents the current from the genera-

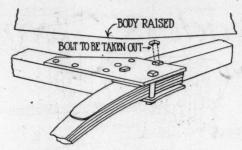


Fig. 3-Raising body to take out Dodge spring

tor going to the battery, forcing the entire generator output over the lighting circuit when the engine is running.

3-Under the above conditions, no. There is greater resistance in the filament of the lights than in the starter motor windings.

4-Dirty contact and improper adjustment of the regulator spring.

Engine Size of New Liberty

'Whittier, Cal.—Editor Motor Age.—Would like information on the new Liberty; motor size, whether it is the Junior or Senior Delco lighting system; whether full float axle or not.

not. 2—Who are the stock owners of the Liberty Motor Car Co. and their daily production?— Motor Car Co. H. W. Bacon.

1—The size of the engine in the Liberty is 31/4 in. bore by 41/2 in. stroke. The rear axle is semi-floating. With reference to the term Junior or Senior Delco lighting system the company states that these terms never applied to the two unit system as

2-The company does not care to give this information in the news columns of any publication.

found on the Liberty.

Removing Spring on Dodge

Walterville, Ore.—Editor Motor Age—I wish to remove the upper rear spring on my 1916 Dodge car as one leaf is broken.

1—Is it necessary to remove the rear fender or fenders in order to raise the body high enough to take the bolt out which goes through the frame and springs?

2—Is it necessary to remove the tire carrier on the rear to be able to raise the body. If so, is there any way to remove it without taking the rivets out where it connects to the gas tank brackets?

3—Is it necessary to loosen the body in front of the front doors from the frame, or

gas tank brackets?

3—Is it necessary to loosen the body in front of the front doors from the frame, or can it be sprung up high enough to remove the bolt that holds the spring without interfering with the front part of the body.

4—If the entire body has to be raised, will it be necessary to disconnect all of the cowl board instruments?—Herbert Smeed.

1-It will make the job much easier to get at if the fenders are removed.

2-No.

3-No. If you remove the rear fastenings of the body you should be able to raise the body sufficiently so you can take out the bolt.

4-Yes.

INCREASED GENERATOR AMPERAGE Use of Resistance Units Will Depend on Voltage of Current

Doniphan, Mo.—Editor Motor Age — We have a Westinghouse shunt wound generator of .32 kw.-32 volt 10 amp. capacity. How can we build up the amperage to 20 to 25 to charge a Ford magneto as per your instructions in a recent issue of Motor Age. This machine is designed to run at 1800 r.p.m. practically, but we can speed it up to 2400 r.p.m. if necessary.

2—We have four Ward-Leonard resistance units of 160 watts, 5 amp., 6.4 ohms. How can they be used? Also, what would happen to these units if used on a 100-volt D.C. circuit to charge from one to 6-volt batteries? Give instructions for use on a 110-volt circuit fithey can be used.—C. F. Allen.

The electrical pressure generated in the armature winding of a generator may be determined by the following equation:

$$\frac{E=Z \times \phi \times p \times r.p.m.}{b \times 60 \times 10^8}$$

in which E stands for the value of the pressure in volts, Z the number of wires on the surface of the armature, o the number of magnetic lines of force entering or leaving the magnetic poles, depending upon whether they are north or south poles, r.p.m. the revolutions that the armature makes in one minute and b the number of different paths through the armature from the negative brushes to the positive brushes. Now the current a machine will deliver is limited by the size of wire used in the armature winding and the number of paths through the armature. Thus if the armature winding is one having two paths, that is, the value of b in the above equation is 2, then the wire must be of such a size that it is capable of carrying one-half of the total current the armature is to deliver. The size of wire on your machine is no doubt carrying its maximum safe current when the total current delivered by the machine is at its rated value; namely, 10 amp. In order to increase the current capacity of the armature winding

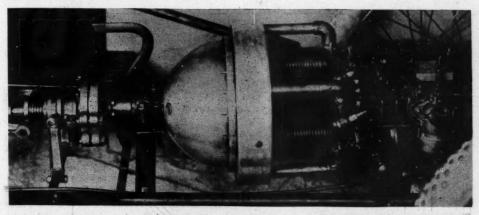


Fig. 4—How the Macomber engine looks installed in a car. There are five cylinders with valves in the head tober place.

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it will be necessary to do one of two things, either increase the number of paths through the armature winding or increase the size of wire used in winding the armature. In order to increase the number of paths through the armature winding, it will be necessary to reconnect the armature winding to the commutator segments. No general rule can be given for the procedure in making this reconnection as the details of the present winding must be known in order to determine what changes may be made. Thus if the winding is now what is called a simplex series winding there are two circuits, or the value of b is 2, and it may be changed to a duplex series winding, or a simplex doubly reentrant winding, not always, however, in which cases there will be four circuits, the value of b being 4. In changing the winding so that there are more circuits, the value of the electrical pressure generated in the winding will be reduced, as may be readily seen by an inspection of the above equation. Thus, if the value of b which occurs in the denominator of the expression for the value of the generated voltage is doubled and all the other quantities in the expression remain constant in value then the value of the generated voltage will be reduced to one-half of its previous value. This reduced voltage multiplied by the increased current capacity will give the same wattage capacity, however.

In changing the current capacity of the armature by winding it with larger wire the voltage will be reduced, as you will be unable to get as many turns of the large wire on the armature as there were turns

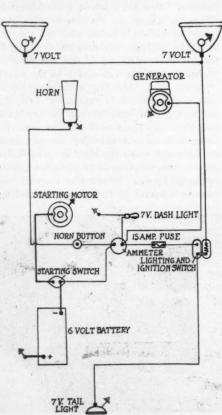


Fig. 6—Starting and lighting system used on Emerson

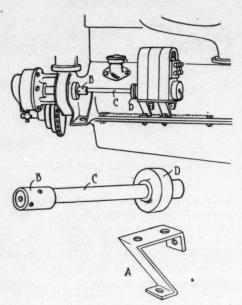


Fig. 5—Method of installing magneto on Studebaker

of small wire. If the turns be reduced the value of Z will be reduced, which accounts for the reduction in the value of the generated voltage. You can now readily see how difficult it is and in fact impossible for us to give you any definite information as to what changes you should make. The easiest way for you to make the changes will be to change the size of wire and put on less turns, making the connections just as they are now. A careful record and diagram should be made of these connections while you are removing the old winding.

Increasing Speed and Voltage

Increasing the speed of the armature from 1800 to 2400 r.p.m. will cause a corresponding increase in generated voltage, assuming all other quantities in the above equation remain unchanged. If the field winding is connected to the terminals of the machine there will be a change in the value of the current in this winding due to any change in the value of the pressure between the brushes and hence a change in the magnetic lines o per pole. If the voltage between the brushes be reduced to approximately one-half of its present value the field coils, assuming there are two of them, may be connected in parallel instead of in series, as they are no doubt now connected.

2—The use of the resistance units will depend upon the voltage of the source of current. Thus if a voltage of 12 volts is available then four of these 6.4-ohm resistances connected in parallel and to the source of pressure will permit a total current of 12 divided by 1.6, or 7.5 amp., to flow. The four 6.4 ohm resistances will have a total resistance of 1.6 ohm when they are connected in parallel.

In charging a 6-volt battery from a 110-volt direct-current circuit it will be necessary to have a resistance of such a value in circuit that the drop over this resistance when it is carrying the desired charging

current will be equal to the difference between the pressure of the source and the pressure of the battery. The pressure of a 6-volt battery when it is charging is about 7.5 volts, so that the voltage over the resistance will be equal to 110-7.5, or 102.5 volts. Now if a single one of the 6.4ohm resistances be connected in series with the battery, this 102.5 volts pressure will produce a current of 102.5 divided by 6.4, of 16.0 amp., which is greater than the capacity of the resistance. Two of the resistances in series with the battery will result in a current of 102.5 divided by 12.8, or 8.0 amp., which is also greater than the capacity of the resistance. Three resistance in series with the battery will result in a current of 102.5 divided by 19.2, or 51/3 amp., which the resistance will no doubt safely carry.

The above method of charging a battery is very inefficient, as such a large part of the total electrical energy delivered by the source is used in heating the resistance in series with the battery rather than producing a reversed chemical action or charging a battery. The efficiency may be improved by connecting more batteries in series and thus reducing the resistance required in order to limit the value of the current. For example, if ten batteries were connected in series then the voltage of the combination while charging would be approximately 10 by 7.5 or 75 volts, and the drop over the resistance would be 110 - 75, or 35 volts. A single resistance of 6.4 ohms in circuit would allow a current of 35 divided by 6.4, or 5.47 amp., to flow. Two resistances in parallel would give a total current under the above conditions of approximately 10.94 amp.

Wiring Diagram on Michigan 40

Ottawa, Kan.—Editor Motor Age—Publish a circuit diagram of North East electric system, showing the motor generator circuits as used on the 1913 model Michigan 40?—A. L. Grav.

The diagram is shown in Fig. 8. This

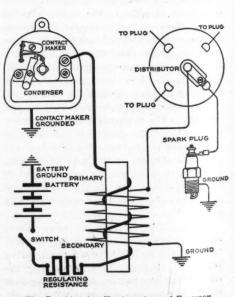


Fig. 7—Atwater Kent system of Emerson four

shows the earlier type of North East system such as was installed in the 1913 Michigan. In some of these the polarity was not marked, and there was some chance of getting the battery and motor-generator connected wrong. The wire leading from the positive terminal of the battery must be connected to terminal No. 1 on the motor-generator and No. 1 on the starting switch. Also the wire from the negative battery terminal must be connected to terminal No. 3 on the motor-generator. If these wires are reversed the battery will be discharged.

STUDEBAKER CLOVER LEAF BODY Can Install Magneto in Powerplant of This Motor Car

Tipton, Mo.—Editor Motor Age—My car is a 1917 Studebaker seven passenger. Where can I get a four passenger clover leaf body, as the rear seat of my car hasn't enough room.

2-What would be probable price?

3—Can I install a magneto in this power plant? If so, explain how.

4—Can the final drive be changed from bevel to spiral bevel? If so, what would be approximate cost?—William L. Redmon.

1—You would probably have to have a body built to order.

2—This would depend on how elaborate a finish the body had.

3-A magneto can be installed on the pump side of the engine, but it will be necessary to build a special platform for the magneto. A suggestion for this is shown ni Fig. 5. First the boss on the pump drive gear casing must be cut so that the shaft will project through a short distance. To mount the magneto, two brackets, A, are made out of strap iron and bent to the shape shown. The brackets are held in place by bolts passing through the crankcase joint and into the upper half of the crankcase. Holes must be bored into the latter and tapped to fit the cap screws. The latter should be about 14 or 36 in. To connect the magneto with the pump gear a sleeve, B, is made, the hole in it being of such size that it will just slip over the gear shaft. To make it possible for the sleeve to turn with the shaft, a hole is drilled through both of them and a small pin inserted. Similarly a pin is used to fasten the sleeve and shaft C in place. At D is shown a conventional form of magneto coupling, which will take up any irregularity in the drive. The latter also makes it possible to time the magneto properly.

4—Yes, but the expense would not warrant the change, inasmuch as the company is not in position to furnish this form of drive and you would have to have these gears cut specially.

WIRING ON EMERSON FOUR CAR Possible to Connect Ammeter and Dash Lamp Into Circuit

Coleraine, Minn. — Editor Motor Age— Kindly give a diagram of the Atwater-Kent Ignition system—one point distributor, as Installed on the Emerson four.

2—Can a dash lamp be connected to this system? If so, what size?

SIDE LAMPS

SIDE LAMPS

STARTING SWITCH

Fig. 8—Wiring diagram used on Michigan car

3—Could an ammeter be installed on the dash to show when the generator is charging and when not?

4—On the above named system, if the generator should be out of order, could the car be run from the current from the battery or vice-versa?

5-Would it be advisable in this system to carry dry cells? If so, how many and how should these be connected?

6—Kindly explain the Apple starting system which is being used on the Emerson Four.—G. H. Kohrt.

1-This diagram is shown in Fig. 7.

2-Yes. As shown in the diagram.

3—Yes. The method of connecting the ammeter is shown.

4—Yes. If the battery becomes discharged, or otherwise got out of order, the starting motor could not be used and the car would have to be cranked. After that

the generator would supply current for running.

5-No.

6—The starting motor receives its energy from the storage battery and cranks the engine until it starts running under its own power. The starter unit consists of three principal parts; the field, which is stationary, the armature which revolves within the field and the automatic pinion shift. The latter is the connecting link between the starting motor and the flywheel of the engine. One end of the motor shaft carries a weighted pinion which automatically engages with the teeth on the rim of the flywheel when the starter pedal is pressed and cranks the engine, the current being supplied from the storage battery.

The generating unit is mechanically driven by the engine and generates the current which is utilized for charging the storage battery and lighting the lamps. The moving part of the generator consists of a shaft on which the armature is mounted and rotates with it. The armature consists of a number of separate electric windings, each of which is connected to its own section of the commutator. The latter is a cylinder made up of insulated copper sections, and is accessible by removing the band at the front of the generator. The armature rotates between two separate windings on soft iron cores, which form electro-magnets and are called fields. When a current passes through the field windings, the field becomes energized and the rotation of the armature between them sets up an electric current in the armature windings, being then discharged through the commutator into the carbon brushes and finally to the storage battery.

DISTINGUISHING TYPES OF AXLES How Novice Can Tell the Full-Floating from Others

Perry, Okla.—Editor Motor Age—How can a novice tell a full-floating rear axle from the other types?—H. G. Doncey.

There are three types of live rear axles in ordinary motor car nomenclature, known as the full-floating, semi-floating and three-quarter floating types. Live axles are those that turn with the wheels, while dead axles are those used on chain-

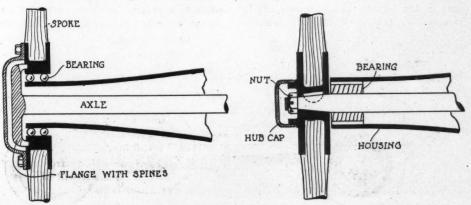


Fig. 9—Types of axles in general use, the first illustration showing a full-floating and the other a semi-floating

drive cars, where each rear wheel is connected to the countershaft sprockets with a chain. The axle in this case stands still as the wheels revolve.

As the name implies, the floating axle is one that floats. That is to say no weight is carried by the axle shaft, all of the weight being taken by the axle housing. The sole function of the axle shaft is to revolve and turn the wheel attached to it. The semi-floating axle, however, not only turns the road wheels but takes some of the weight of the car also. The essential difference of these two types is in the position of the wheel bearings. In Fig. 9 is shown a full-floating axle, and reference to this will show that the wheel bearings are placed on the outside of the housing. The rear wheels of the car rest upon these bearings. Obviously if the wheels rest upon the bearings and the latter in turn rest upon the housing, the housing must support the entire weight of the car. The end of the axle shaft has some form of jaw clutch which fits into depressions in the wheel hub. Thus when the axle shaft turns, the wheel must turn also. In the floating axle this connection is flexible, but in the three-quarter floating type the end of the shaft is attached permanently to the wheel, usually by means of bolts.

In Fig. 9 is shown a semi-floating type of rear axle, and here it will be noted the bearing for the wheel is placed in the inside of the housing, instead of on the outside. The wheel is placed on the axle shaft and held in place by a key and nut. The latter is used to prevent the wheel from backing off, the nuts being locked with cotter pins.

The three-quarter floating type of axle is exactly like the full-floating, with the exception that the method of securing the axle to the wheel is somewhat different. As before stated, in the floating type the joint between the wheel and axle shaft is flexible, while in the three-quarter type the shaft is attached rigidly. The latter type has all the advantages of the full-floating but has the disadvantage in that the shafts are subjected to additional end stresses due to side slipping, etc.

You always can tell a full-floating type of axle from the semi-floating by the fact that in the former the drive axle can be removed by taking off the hub cap and

pulling out the shaft. This can be done without removing the wheels, which will hold up the car whether the axle shafts are in place or not. By jacking up the car to take the weight from the wheels, the wheel may be drawn off the housing.

Converting Metz for High Speed

Courtland, Ala.—Editor Motor Age—How can I convert my Metz speedster for high speed work? Is there any way to substitute a rear axle and transmission for the present drive? If so, what type would be best and what would be the approximate cost?

2—Could a Ford transmission and rear axle be used by using the Ford crankcase?

3—This car is to be used on a half-mile track. What would be the best gearing?—Wm. Sherrod.

1-In converting any car for high speed work, providing the car allows it, there are many things which can be done to increase the speed. For one thing the gear ratio can be changed; light reciprocating parts installed in the engine; ignition set ahead and a larger carbureter fitted. The valves can also be given a greater lift and their diameter increased. If you are equipped to do the work yourself, you may be able to change the friction drive and install a different rear axle, but we know from experience it will mean a lot of work. If you will have to have the work done by some shop the expense of changing the car to a gear driven machine would hardly be advisable.

2—If you use this much of the Ford mechanism you may as well use the cylinder block of the Ford also.

3-About 23/4 to 1 or 3 to 1.

Engine Overheats

Bluford, Ill.—Editor Motor Age—What is the cause of the engine on my 1917 Chevrolet 490 overheating? The ignition is exact, and the engine is free from carbon. It has a Zenith carbureter and engine idles down good and runs good, but it will boil the water in a 3-mile run. I have put in new hose connections.—Rolla F. Maxey.

Granting that the water is circulating through the cylinders properly, a number of reasons may be advanced for the engine overheating. Carbon is a very common source of overheating. The presence of this element in the cylinders in undue amount will cause pre-ignition, which in turn will heat the engine. This will be accompanied by a loss of power. Too rich a mixture is another common source of an engine becoming too hot. See that the

carbureter is properly adjusted and that the fuel valve is seating. The oil level in the crankcase should be watched and neither too much nor too little oil supplied. Also disconnect the muffler and if the boiling ceases, it would then show that the muffler is choked and causes back pressure. These are some of the more common sources of overheating. Motor Age also suggests that you examine the fan belt for slippage. Sometimes, too, the rod which regulates the spark shifts out of position, so that the engine seems to be running with the spark advanced properly, whereas it may be in the retarded position.

Loose Bearing on Ford

Hillsdale, Mich.—Editor Motor Age—What is the probable cause of the rear crankshaft bearing on a Ford 1916 touring car becoming loose? I have thoroughly overhauled the car and it seems in good shape. One mechanic informs me he had trouble of the same kind and that the crankshaft with magneto and transmission was found to be out of line, which, when corrected, remedied the trouble. Do you think this is the trouble with mine?—L. H. Norris.

Indications are that the bearing was not put back properly when the engine was reassembled. There is a possibility that the crankshaft at the bearing point may have become worn out of round, or in other words, is over in cross section. If the bearing cap was fitted and tightened when the major axis of the oval section of the crankshaft was in a vertical position it would be somewhat looser when the crankshaft was turned a quarter turn. This might allow the retaining bolts to work loose, thus letting the bearing cap down and loosening the bearing. We do not think it probable that the crankshaft was out of line to such an extent that it would loosen the bearing.

Wishes Position in Factory

Columbus, O.—Editor MOTOR AGE—Where can I get information as to a position in a Michigan automobile factory either in the assembly or test?

2—Does a 16-valve cylinder head on a Ford use more gasoline than the regular valve?

3—Where do the present day race drivers get their start?

4—Is "Cannonball Baker," the endurance racer, the same man who raced motorcycles in 1912 for the Indian people?

5—Is the Hudson taking on racers for their teams?—J. W. Guy.

1-Write to the employment department of the factories.

2-No.

3—A great many started as testers for motor car concerns. Others have followed the racing game out of sheer sport usually financing themselves. Many drivers, in fact, the majority, started out as mechanicians, being ultimately graduated into the ranks of the pilots of high-speed cars.

4-Yes.

5-No.

Converting a Marmon 32

Indianapolis, Ind.—Editor Motor Ace—Publish a sketch showing a Marmon 32 touring car converted into a speedster or a semi-speedster something like the model 32 Oakland shown on page 42 of your May 31 issue.—C. Zinkan.

A suggestion for this is shown in Fig. 11.

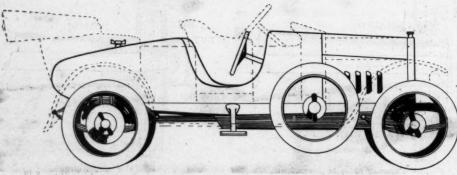


Fig. 11-Suggestion for converting Marmon 32 five-passenger into speedster

Dickups from the Tractor Field

ENTER line of draft for the tractor through the center line of draft for the plows is a feature of the Case 10-20 kerosene tractor. This tractor is designed to pull three 14-in. plows. It has two drivers, bull wheels 22 in. wide and a 10-in. auxiliary clutched-in driver, which makes it easy to operate over soft places. It does not pack the soil and the weight is evenly distributed. It can be used for belt work. The belt pulley is on the crankshaft, operated through a clutch. A valvein-the-head water-cooled engine is used, the upper half of the crankcase and the cylinders being block-cast. Lubrication is by plunger pump and ignition by high-tension magneto. This tractor has a drawbar oull of 10 hp. but is said to be capable of delivering 14.7 hp. Other tractors made by the J. I. Case Threshing Machine Co., Racine, Wis., have general qualifications as follows:

Model 9-18, plows handled, two 14-in.; speed, 21/4-31/2; drawbar horsepower, 12. Model 12-25, plows handled, four 14-in.; speed, 13/4-2.2.

There are two other models—the 20-40 and the 30-60—which are designed for any heavy farm work, both being gas and oil tractors.

NEW FUEL FROM KEROSENE

London, June 11-A process for making a fuel from kerosene that is claimed to be suitable for use in high speed internal combustion engines has been invented by William Augustus Hall, a London chemist. It consists in taking the fraction of gasoline -from which the gasoline or petrol has all, or substantially all, been stripped-boiling up to about 220 deg. C. and passing the fraction, which constitutes the spirit or drying portion of the oil, between very small interstices under a very high pressure, the pressure being from 1,000 lbs. per square inch to even 3,000 lbs. per square inch or more, in the presence of a gas containing hydrogen or a hydrocarbon gas at a temperature not above that of the lowest boiling point of the liquid, say 100 to 120 deg. C.

A combination of the gas and the liquid hydrocarbon results, and a certain amount of hydrogenation of the latter causes a considerable lowering of the flash point of the liquid hydrocarbon and an alteration of the odor.

The apparatus for producing this new fuel may be a form of hydrogenizer of the kind used in homogenizing milk, consisting of a series of metal disks or plugs between or through which the liquid is forced in the presence, of gas. The metal disks or plugs preferably are made of nickel and may be

very finely grooved. The gas may be hydrogen or any coal gas containing hydrogen or hydrocarbon gas such as oil gas or acetylene.

The product is distinguished by its flash point, much lower than the fraction of kerosene having this boiling range, and by the loss of the kerosene odor and the presence of a new odor and a new liveliness of the fuel not possessed by kerosene when used in a high-speed internal combusion engine.

FRANCE NEEDS TRUCK DRIVERS

Marietta, Ohio, June 22—So badly does France need transport drivers that the members of one of the college ambulance units, just arrived there, will not drive ambulances but munition trucks. This is according to a cablegram received in this city from Beman G. Dawes, now with the Marietta College unit. The twenty men of the unit will be under the direction of the American field service just as though they were in the ambulance service but will be transport drivers.

INGRAM-HATCH REORGANIZES

Rosebank, N. Y., June 22—The Ingram-Hatch Motor Corp. elected the following officers at the annual meeting of the stockholders at the company's factory here recently: President, Joseph W. Cody; vicepresident, Joseph A. Ingram; treasurer, James J. McCullum; secretary, John T. Oates. Walter P. Hatch resigned as vicepresident and sales manager, and Nelson T. Gutelius was appointed sales and advertising manager.

The Ingram-Hatch Motor Corp. is capitalized at \$1,000,000, but negotiations are under way to increase the capital and to greatly expand manufacturing facilities. The corporation soon will announce an aircooled, two-cycle oil engine for stationary, marine, farm tractor and motor truck purposes. The Ingram four-cycle, air-cooled engine and double friction-drive passenger car are the main features of the line. This engine also will be made for trucks of from 1- to 5-ton capacity.

DUTCH FARMERS BUY CARS

New York, June 22-Farmers in the Netherlands bought motor cars for the first time during 1916, and this in part explains the active demand. Wealth also increased in all classes. These facts are according to export figures showing the business done by American representatives in Holland. The good business was in spite of difficulty in getting enough tires. Often a shipment of cars without tires would arrive from the United States, only to be stored away until tires arrived. Even then the delays were frequent on account of the requirement of satisfactory guarantees that the tires would be used solely in Holland.



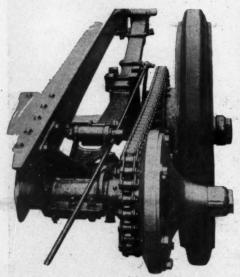
The Case 10-20 tractor double disking. This is the medium-sized machine

Highgrade Truck of Medium Weight

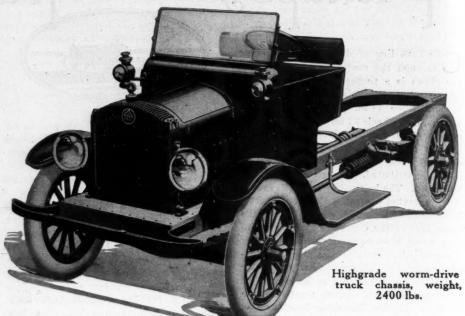
Carries a 2250-Lb. Load

THE Highgrade truck has been introduced by the Highgrade Motors Co., Grand Rapids, Mich., and comes in that class of trucks between the big tonnage jobs and the cheaper delivery cars. It is a worm-drive truck, the standard series A-17 chassis weight being 2400 lb. The maximum allowable load on chassis, including the body, is 2250 lb. By using oversize 35 by 5 tires, the net carrying capacity is increased 25 per cent without overloading the springs, it is said. For economy in tire expense, gasoline consumption, etc., a normal loading at 1500 to 1750 lb. is recommended with the standard equipment. With a ton load the oversize tires are advisable. At normal engine speeds the car speed will be about 20 m.p.h., this speed being controlled by a Simplex governor driven from the propeller shaft. The Highgrade has a wheelbase of 115 in., the frame length back of the driver's seat being 104 in. The wagon bed floor is 31 in. from the ground.

A Wisconsin engine is fitted, having a bore of 31/4 in. and a stroke of 5 in. The cylinders are enbloc with removable cylinder head. The lower crankcase is made of aluminum alloy and can be removed for adjustment of connecting rod and crankshaft bearings. The crankshaft is 2 in. in diameter, drop forged from chrome nickel steel and heat treated to a tensile strength of 125,000 lb. it is stated. Carbon steel is used in forging the camshaft with the cams integral on the shaft. This shaft runs in long phosphor bronze bearings and is lubricated by the oil that collects in the oil pockets which are cast in the bearings for this purpose. Connecting rods are I-beam construction forged from carbon steel. The



New chain drive of Tonford truck attachment which sells at \$350



inclosed valves are operated mechanically on one side of the engine by a single camshaft.

Both intake and exhaust valves are interchangeable. Removable valve stem guides are provided, which can be replaced to take care of the wear. The valve tappet guides are separate castings and are held in place by a forked forging. By loosening this forging, the complete tappet assembly can be taken out, including the guide. A removable metal plate covers the valves, which keeps them free from dirt. Timing gears are helically cut.

Combination force-feed and splash system of oiling is fitted, the oil being circulated by a plunger pump. The carbureter is a Zenith fixed nozzle type bolted directly to the cylinder block casting. Gasoline is carried in a pressed steel tank equipped with a gage and located on the dash. The fuel is fed by gravity. Ignition is by a Simms high-tension magneto. A balance wheel type Leece-Neville starting system is fitted, with Bendix drive. The lighting generator is gear-driven and a separate unit from the ignition system. The clutch is a single plate Borg & Beck.

The radiator is of the flat tube type with aluminum cast header tank, the core being bolted in place. This allows quick repairs in case of damage. A motometer is attached to the filler cap as standard equipment, and on each side of the radiator lamp are brackets which have an adjustment for properly focusing the head lamps at any distance desired. The adjustment once made can be locked in place.

On the standard chassis the gear ratio is 18 to 1 on low, 9 to 1 on intermediate, 4.5 to 1 on high and 18.56 to 1 on reverse. The entire chassis is painted a battleship gray, except the radiator, hood, fenders, dash and seat, which are in black. Equip-

ment includes speedometer, motometer, electric lights, windshield, dash and rear oil lamps, electric horn, extra rim, etc.

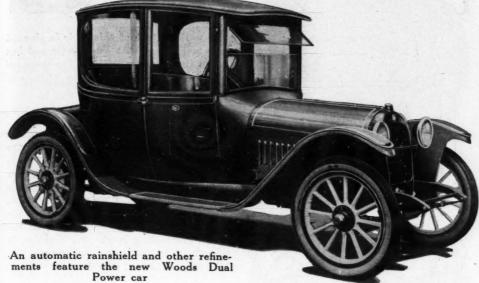
TONFORD INTERNAL DRIVE TRUCK

In addition to the regular double chain drive truck attachment for Fords, the Detroit Truck Co., Detroit., is now manufacturing an internal gear driven model. This new attachment, styled the Tonford, is equipped with a standard Model 0, 11/2-ton type Torbenson internal gear driven axle and is supplied with gear ratios of 51/2, or 61/2 to 1, as desired. Later it will be supplied with a gear ratio of 8 to 1, suitable for hilly country. The method of attachment of the new model is practically the same as that of the former, except that the Ford rear axle is entirely removed and replaced by the internal gear driven axle. The feature of the internal gear drive is that it does away with noisy chains and sprockets; and permits all wearing parts to be inclosed. The price of internal gear model is \$390. A slight change has been made in the chain-driven model. The countershaft sprocket has been made 24-tooth instead of 34-tooth, permitting a smaller rear sprocket, and increasing the road clearance. The price of this model is \$350. Both models have a heavy pressed steel frame, that permits the mounting of a 9 to 11 ft. body back of the driver's seat.

NEW CHALMERS BODY DESIGN

Detroit, June 22—A new Chalmers body has been fitted to the present chassis. It is known as the Six Duplex and is a four-passenger design with speed lines. The body is a four-door type with slanting wind-shield, raked steering column, leather Scotch plaited upholstery and pantasote top, and side curtains. It sells for \$1,475 f. o. b. Detroit.

Larger Body for Woods Dual Power



DEALERS whose specialty is the luxury-type cars are offered a companion to the class of aristocrat cars in the new series dual power Woods made by the Woods Motor Vehicle Co., Chicago. Mechanically the car differs little from the first model, but it has been changed in other details.

Most important, perhaps, is the change in wheelbase, which has been increased to 124 in. This makes it possible to fit a spacious body, the upholstery and finish of which are carried out very luxuriously. There are also many new agreeable conveniences in lighting. An adjustable rain shield has been fitted, automatic window lifters and a rear vision mirror extending across the entire front. The lines of the body are harmonious and altogether the car presents a very smart appearance.

Simple Operation

Extreme simplicity of operation has been added to the above ensemble, for the driver of a Woods dual power car does not have to shift gears. All operations are controlled with a single foot pedal. This pedal starts, accelerates, brakes and stops the car with little or no effort on the part of the driver. Both hands are thus free for the steering wheel. The dynamic brake controls speed, without the danger of skidding, it is claimed. Except for emergency stops, the mechanical brake is not needed, resulting in saving tires and brake lining.

Irrespective of the drive shaft and rear axle, there are but three units in the mechanism of the car. Located conventionally under the hood is the engine and directly behind this is the electric motor, a unit in line with the engine. The storage battery set is located under the front seat. The connecting link between the engine and electric motor is in the form of a magnetic clutch. When the gasoline lever is raised about an inch from full retard the

flywheel of the engine becomes magnetized and pulls a copper disk against the face of the flywheel and the electric motor and engine are connected. The engine or electric motor may be used singly or together. Any condition which would cause stalling in the conventional form of gas car would simply cause the engine of the Woods dual power to develop its maximum horsepower, after which a reduction in speed of the engine would take place. Then the electric motor immediately and automatically comes to the assistance of the engine and furnishes additional power as required. The electric motor is ready at all times to run the car independently, or to assist the gasoline engine to run the car under a load. It also serves as a dynamic brake to stop

The new model is fitted with an engine having a bore of 2% in. and a stroke of 4 in. Light reciprocating parts make it well suited for high speed work. Cooling is by thermo-syphon through a tubular type radiator. A force-feed oiling system is fitted and the gasoline, which is fed by gravity, is located in the cowl. The tank has a capacity of 8 gal. The storage battery is a Woods Exide of twenty-four cells. Ignition is by Atwater Kent, with automatic spark advance.

A channel-section steel frame suitably

Wheelbase Is Now 124 In.

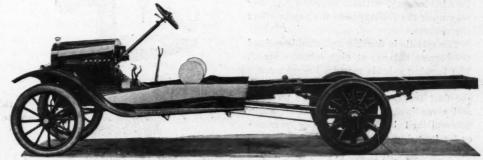
braced by cross members is carried in front by semi-elliptic springs and cantilevers in the rear. The front axle is an I-beam. while the rear is semi-floating, the wheels being mounted on driving shafts which float on Bock roller bearings. The axle tubes are made of swaged steel tubing, which flange on the inner end and are bolted to the axle housing which surrounds a complete unit containing the Baush hourglass type of worm gear. The brake shaft bearings mounted in this axle are selflubricating. The axle is trussed to obtain the maximum strength with minimum weight. Control of the car is by two finger levers on the steering wheel. The outer lever controls the electric equipment and the inner the gasoline.

Aluminum panel construction is used in the body, which is a coupe design. The doors are made exceptionally wide and the windows may be lowered. On the instrument board is found an ampere-hour meter and ammeter combined, also a speedometer with odometer trip attachment. The light switches are on the steering mast and the warning signal on the steering wheel. A compartment under the rear hood contains space for a spare casing or demountable rim. Another compartment contains the tire pump and tools. The headlights are equipped with auxiliary bulbs for dimming. The standard finish of the car is in blue or green, with wheels in a light straw color.

The price of \$2,950 is with the wood wheels. Wire wheels are listed at \$25 additional, and the same figure will equip the car with slip covers. Cars in special color effects to suit the individual tastes of owners will be furnished for \$100 additional.

TO AFFILIATE WITH S. A. E.

Chicago, June 22—The National Gas Engine Association voted to affiliate with the Society of Automotive Engineers as regards all engineering matters.



Chassis of new model Tonford made by Detroit Tractor Co.



The Accessory Orner



HarWard Piston Ring

HE HarWard Mfg. Co., 3939 Magnolia avenue, St. Louis, Mo., is manufacturing a unique piston ring of one-piece construction. The inter-locking members of the joint engage in such a manner that no opening will occur in any direction, thus making compression positive and helping to keep the oil from entering the combustion chamber. Two rows of patented oil pockets are cut into the outside surface of the HarWard ring for receiving and distributing excess oil, which would otherwise pass upward into the combustion chamber. The heavy film of oil retained in these pockets also helps to secure high compression and at the same time helps to give the ring flexibility, due to the material cut away in making these pockets.

Flaglite Flag Holder

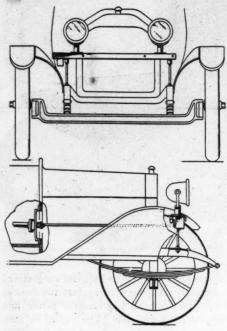
The Flaglite, which attaches to the radiator filler, serves to hold a silk American flag, and to illuminate it at night. In addition it serves a useful purpose in that it illuminates the motometer and may also be used as an inspection lamp. It is substantially made, both as to the reflector, which is designed on the principle of the Flood Light used to illuminate large areas effectively, and the wiring connections. It can be attached in 5 min. and becomes a permanent, useful adjunct. The lamp is made of brass silver plated inside and outside and the bracket, adjustable to various sized fillers, is cold rolled steel with a baked-on hard rubber finish. The flag staff is screwed into a receptacle over the reflector. A silk flag accompanies the outfit. The complete outfit sells for \$2. The Flaglite Co., Cleveland, Ohio.

Langelier Vertical Tapping Machine

A vertical tapping machine of bench and floor type of capacity for tapping ¼ in. in brass, and $\frac{1}{16}$ in. in steel, recently placed on the market by the Langelier Mfg. Co., Providence, R. I., embodies several useful features of construction. One feature is an automatic reversing mechanism which causes the tapping spindle to instantly reverse in direction of rotation at a pre-determined depth, without depending in any way upon the resistance to the tap to effect the reverse.

The spindle is floating and double-splined for correct balance at high rotative speed. The tapping spindle may be brought down and engaged into the work by depressing the foot treadle provided for the purpose, and a continuation of the tap penetration accomplished by continuing the pressure or by lowering the hand feed lever.

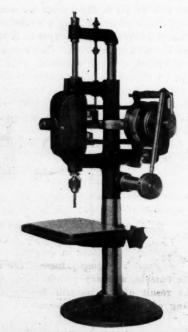
The adjustable table is of ample proportions to hold ordinary sizes of jigs or work.



Front and side views of Beach Dirigible headlight



HarWard piston ring of one-piece construction



Langelier vertical tapping machine of bench and floor type

The working face of this table is planned true and square with the spindle and has an oil rim on all four sides. The space occupied on the bench is 15½ by 10 in., and the net weight is 240 lbs.

The Superspark

This is an auxiliary spark gap that is placed in the spark plug circuit for the purpose of intensifying the spark. It is attached to the terminal of each plug on the engine; the secondaries being attached to the terminals of their respective gaps. The effect of the gap is to increase the voltage, and decrease the ampere of the spark, eliminating spark plug troubles, it is said. Price, \$2 each. SuperSpark Co., 1330 Majestic Bldg., Detroit.

Stewart & Co. Specialties

Stewart & Co., 200 Broadway, New York, making a specialty of motor car hardware market a belt-driven valve grinder called the Nasco. This grinder consists of the grinder stand proper with one 5-in. wheel, complete with all attachments, one reamer handle, five pilots and four reamers. The price of the complete set is \$30. The company also sells the Victor round belt coupling in sizes from 1/4 to 1/8 in. The price of these ranges from \$2 to \$7.50 a dozen. Another belt coupling marketed is the Toscot, intended for flat belts, ranging in price from 90 cents to \$1.10 a dozen for the motor car sizes. Standard valve grinding compound is put up in convenient 4-oz., double, screw cover boxes, containing two grades. The coarse grade is for quickly cutting out the pits and roughness, while the fine is for finishing the valve and seat. The price is 40 cents. Ozigene, another product handled by this concern, is a preparation to be put into the gasoline tank to facilitate combustion. More mileage and elimination of carbon is claimed by the use of Oxigene. Fifty gallons of gasoline can be treated with 5 oz. of the fluid, which sells for \$1.

Pimbley's Auto-Newer

This consists of a preparation to bring back the luster to all exterior varnished surfaces on motor cars, etc. It does not add to the coating, but simply removes the streaks, or bluish almost imperceptible coating that obscures the finish. After application, when the preparation is rubbed dry and hard, the original luster will be brought back. It is claimed that this preparation contains no ingredients which might have a destructive effect on the finish of the car, and can be applied as often as needed. The preparation is applied by dampening one end of a piece of cheese cloth, and rubbing it on the body. If

the car has been washed previously, it is necessary to wait until it is perfectly dry before the renewer is applied. The price is \$1. The same concern also markets a preparation known as Pimbley's Auto-Top-Newer. This is a black liquid to be applied in the same manner as paint. It dries in 15 min., is waterproof and said not to rub off. It can also be used on seat cushions and other trimmings of the car. It is packed in three sizes of friction—top cans in half pints, pints and quarts. For dealers it is put up in gallon cans. Pimbley Paint & Glass Co., St. Joseph, Mo.

New Hartford House Organ

The Hartford Hustler, Vol. I, No. 1, with the slogan Knowledge is Power, is off the press, containing in the issue full descriptions and illustrations of the Hartford Shock Absorber, Hartford Bump Absorber and the Hartford Auto Jack. The reading matter is thoroughly educational to those seeking comfortable riding and the illustrations graphically show everything connected with Hartford equipment. The Guide to Riding Comfort, of six pages, is of paramount assistance to those wishing to know how to select a suitable shock absorber for a car. Practical sales pointers on all Hartford equipment are also included between its covers. Dealers may be interested to know that the book is published by Edward V. Hartford, Inc., Jersey City, N. J., for gratuitous distribution.

New Pittsburgh Spot Light

The Pittsburgh Electric Specialties Co., Pittsburgh, Pa., has placed on the market a new 6-in. spot light known as the Pittsburgh six. This lamp has a triple curvature parabolic reflector which re-directs and reflects the light of the filament so that it is all projected in a powerful beam of uniform intensity. The Pittsburgh six has a push button switch in the handle and is attached to the windshield by a new Tswivel 270 to 360 deg. bracket, the same as used on the Parabolite. This gives it a complete swing vertically and a threequarter swing horizontally-which enables the driver to light the inside of the car as well as all points outside. It is equipped with a 31/2-in. diminishing mirror.

Beach Dirigible Headlight

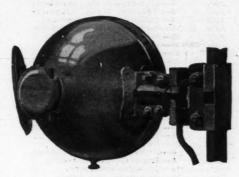
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The Beach Dirigible Headlight is said to do away with all trouble from glaring headlights from other cars and does not itself blind any approaching driver. Any headlight can be attached to this appliance. The device is so constructed that the lights can be thrown down or to either side of the road. The control for this is simple and is right beside the driver. The control rod may be carried either through the dash or to the side of the windshield. In a fog the Beach device is said to be especially valuable, as it is possible to throw the lights along the side of the road in front of the car, making it possible for



Flaglite holder for flags, illuminated



Pittsburgh spotlight, which swings to light car when desired

the driver to proceed. Altogether the lights can be thrown from 800 ft. ahead to 12 ft. in front of the car. Essentially the apparatus consists of a rocking crossbar which fits into the lamp bracket sockets of the cam. On the bottom of this cross bar is a rack with a sector of a gear fitting into it. The control rod, on the end of which is this sector, runs back, as stated before, to the side of the driver, where it is locked in any desired position by means of a special bracket. The lights will be held in this position until changed by the driver. George Watson Beach, 126 Liberty street, New York.



Editor MOTOR AGE—There is no question but that the general tire-using public has entirely the wrong impression about the increase in air pressure in tires during warm weather. The heat in question does not come from the temperature of the air on the outside, as many people think, but is the result of the natural flexing and bending of the tire—an internal friction or heat.

As this heat is due to flexing, the same amount of heat is created regardless of the temperature. The only difference between summer and winter is the fact that the difference in temperature between the inside and outside in winter is not so great and the heat is not distributed so rapidly. The temperature, therefore, rises to a slight degree higher in summer than in winter.

The average tire user believes that to overcome this effect of overheating he must decrease the pressure in his tires. Since this increases the flexing, thereby creating more heat—for the softer the tire, the more bending and flexing it undergoes—he has aggravated the very condition he sought to alleviate.

Another impression decidedly erroneous is that with an increase of 15 or 20 lb. pressure, there is a possibility of the tire bursting. As a matter of fact, tires are not the fragile things some people think. They are able to withstand a pressure of three, four and even five times as much pressure to which they are ordinarily inflated. In fact, the average tire cannot be burst on the ordinary rim, as the rim is much weaker than the tire.

Doubts Test Figures

The statement that a pressure of 95 lb. was reached in a certain test that you mentioned is hardly believable. Working it

out in an equation form that — equals a

constant where the volume remains the same as it does in a casing. Substituting the absolute zero for the temperature, Fahrenheit, which is 495.5 deg. and assuming that the temperature to start with was 75 deg., the result is a temperature of 534.5

deg. The equation — equals K, when

filled in for these pressures and temperatures, reads as follows:

$$\frac{75}{---} = \frac{95}{---}$$

X. equals 678 deg. absolute or Fahrenheit 218 deg. This is above the boiling point of water, which is absurd to even think about. Computing increased air pressure is very simple, since it involves simply the fundamental laws of physics.

Conditions in a short trip of about 50 miles in slow driving would be such—with an increase of 20 lb.—as are not met with on the race track, at very high speeds and long distances in extremely hot weather.

Personally, I believe we cannot lay too much importance on the necessity for educating the public, for the air they let out of their tires in summer is much more dangerous because of under inflation results than the results from extra air pressure possibly could be. It must be always borne in mind that the amount of heat tires generate in use will be lost as soon as the car has stood for a short time.—G. E. Brunner, manager service department, Goodyear Tire & Rubber Co.





GOODRICH Transfers Simpson-George O. Simpson, for the last seven years manager of the Philadelphia branch of the B. F. Goodrich Rubber Co., has been appointed manager of the Kansas City branch, succeeding F. A. Oberheu.

Harry Newman to Handle Ranier-The organized Harry Newman-Stratton newly Co., Chicago, has closed a contract with the Ranier Motor Corp., New York, whereby it becomes distributor for the northern part of Illinois, Wisconsin and the eastern part of Indiana for the Ranier worm-drive, ½-ton truck. The contract involves a purchase of more than \$400,000. Besides its headquarters in Chicago the company will have pranches at Milwaukee, Springfield and other cities.

Morgan Screw Delays Removal of Plant-The Morgan Screw Corp., Newport, R. I., which has been making arrangements to move its plant and headquarters to Watertown, Wis., where local capital subscribed to a \$50,000 capital stock interest and provided a suitable factory building, has notified the local committee in charge that it will obliged to delay consummation of the deal until the government's course with respect to control of the steel industry of the nation is determined more definitely. The plan of removal has not been abandoned, it is stated, but the delay is made merely to safeguard all interests concerned.

Packard Electric Elects-The Packard Electric Co., Warren, Ohio, has elected the following officers: President, N. A. Wolcott, treasurer for the last fourteen years; vicepresident, Charles Fillius; secretary, R. E. Gorton; and treasurer, N. A. Wolcott. company has purchased a group life insurance contract which insures the employees' lives for the amount of one year's salary. The insurance increases with salary increases and provides an increase of \$100 for each year of service, with a maximum increase of \$500. The premiums will be paid wholly by the Packard, and the benefits of

CONTESTS

-1917-

—1917—
-Newark, N. J., track.
-Visalia, Cal., road race.
-Spokane, Wash., track.
-Uniontown, Pa., speedway.
-Tacoma, Wash., speedway.
-Omaha, Neb., speedway.
-Rochester, N. Y., hiliclimb.
-Missoula, Mont., track.
-Intercity Reliability.
-Anaconda, Mont., track. June Intercity Reliability.

Anaconda, Mont., track.

Great Falla, Mont., track.

Billings, Mont., track.

Flemington, N. J., track.

Cincinnati, Ohio, speedway.

Uniontown, Pa., speedway.

Albuquerque, N. M., track.

Pike's Peak, Colo., hill climb.

Providence, R. I. speedway.

Trenton, N. J., track.

New York, speedway.

Uniontown, Pa., speedway.

Uniontown, Pa., speedway.

Chicago, speedway.

Richmond, Va., track.

New York, speedway.

* A. A. A. Championship Award Event.

SHOWS

Fremont, Neb., tractor dem-onstration. Spokane, Wash., interstate fair.

- Milwaukee show, State Park fair, West Allis.

- Dallas, Tex., state fair. 2. 9-

the insurance are to be in addition to those provided for by the Ohio compensation law. The company recently distributed a bonus

to those employes who have been with the company for five years or more, the size of the bonus being governed by the number of years.

16,015 Willys-Overland Mark for May-Willys-Overland Co. manufactured 16,015 cars in May. Present indications are that the company will manufacture from 100,000 to 110,000 cars in the first six months of the current year.

Collins a Jones Motor Car Official-R. D. Collins, for several years in banking and lumber business in the South, has become vice-president and director of the Jones company. Announcement was made recently that the Jones company would accept Lib-erty bonds in payment of purchases of its

Comet Begins Production on First Series -The Comet Automobile Co., Decatur, Ill., has made rapid progress in getting in production and has begun the building of its first series. Deliveries start this month. Comet car has a 50-hp., 3% by 5-in. engine, 125-in. wheelbase, self-oiling cantilever springs and is built with double cowl body.

Strauss Organizes Motor Company-A motor truck company of Louisville men is being enlisted by Harry Strauss, until recently president of the Ever Ready Motor Service Co., who joined the motor corps division of Uncle Sam's regular army last week. He is rounding up a company of drivers for motor lorries and cars, which are an essential part of a modern army.

Ohio Registers 292,000 Gasoline Cars-Up to June 8 292,000 gasoline cars were registered in Ohio. The number of electrics registered was 4,400, and 3,400 manufacturers and dealers were registered. The receipts of the department up to that time were approximately \$1,600,000, which is far in excess of the amount taken in up to this time in any former year.

Co-operates With Government for Drivers The Packard Motor Car Co., co-operating with the United States government, is advertising for drivers and competent mechanics for the motor truck division of the United States army and for foreign service by opening its employment department to applicants for such duties. The company is publishing advertisements daily in the newspapers to further this work.

Gives Salesmen Prizes—More than 15,000 salesmen and dealers selling tractors equipped . with Hyatt bearings participated in a recent sales letter contest conducted by the tractor bearing department of the Hyatt Roller Bearing Co. at Chicago, in which \$200 in prizes were offered. John Lundhagen, Fargo, N. D., received first honors and \$100; J. N. Parvin, Hutchinson, Kan., \$50, second; and J. H. Hazelwood, Des Moines, Iowa, \$25, third.

Pennsylvania Employees Ald Red Cross-Employees of the Pennsylvania Rubber Co. have voted to abandon their annual picnic. This has been done so that the expense of the picnic might be saved and turned over to the Red Cross. Following this action of the employees, the Pennsylvania Rubber Co. sent its check for \$1200 to the Jeannette Red Cross unit. The Pennsylvania recently has taken up the work of having issued to its men and women employees life insurance policies, upon which it is paying a premium. To employees who have been with the company one year, policies for \$300 are given;



ECHOES OF CHICAGO'S USED CAR SHOW-Presenting the Oakland Six that was a gift in the show. W. G. Tennant, secretary of Chicago Automobile Trade Association, is presenting the bill of sale to August Dahl, the new owner. Mr. Dahl's daughter is seated in the car, while Thomas P. Convey, show manager, stands at the right



two years or over, \$500; for each full year over two years, an increase of \$100 annually until the maximum of \$1,000 is reached.

Rubber Factory Is Transferred—The plant of the Mechanical Rubber Co., Cleveland, Ohio, with 12 acres of land, has been transferred to the United States Rubber Co.

Bear Makes Change—M. M. Bear, who has been in the sales department of the Jackson Auto Radiator Works, Chicago, for some time, has been made office manager of the Illinois Auto Sheet Metal Works.

Willys-Overland Triples Motor Output— The Willys-Overland plant at Elyria, Ohio, is working night and day shifts, having tripled the output of motors. Nearly 1,500 men are employed at the plant. The motors all go to the Toledo plant.

Tillotson in New Factory—The Tillotson Carburetor Co., Toledo, Ohio, is moving into its new factory and will employ 500 men and turn out 2,000 carbureters daily. The Willys-Overland Co. is taking the major part of this.

Harroun Makes Shipments—The Harroun Motors Corp. commenced assembly June 16 and began shipment June 18. The first day's shipment amounted to twenty-five cars. The company now has all of its materials on hand and expects to continue a steady production Five hundred men are employed at the plant.

10,000 Maxwells in May—The Maxwell Motor Co. produced and shipped 10,000 cars in May, a new record. On several days the shipments reached 500, the record daily output, however, being 626 cars. This company has started the employment of women in several branches of its manufacture.

To Make Airplanes and Engines—The Boyd Motors Corp. has been incorporated in Delaware with a capital of \$5,000,000 to manufacture engines of the valveless type for motor cars and airplanes. The charter of the company permits it to manufacture airplanes and aviation engines.

University Man Invents Shock Absorber—George H. Hayes, comptroller for the University of Minnesota, has invented a glide spring shackle to absorb shocks. The steel shackle weighs 8 lbs., and four of them are equipment for a car. Each is attached to a spring, front and rear. Two hinged arms connected by a spring form the invention.

Glant Tire Works Night Shifts—The Giant Tire & Rubber Co. of Akron, which recently purchased the Toledo-Findlay Tire and Rubber Co. plant here, is working night and day shifts. The new company is rebuilding tires and manufacturing accessories and within the next month will begin the manufacture of tires. The plant is equipped to

TWICE TREBLED

The Prest-O-Lite Co., Inc., Indianapolis, Ind., entered the storage battery field two years ago. The original output of 400 batteries a day soon fell short of the demand, and a new plant was built, which trebled the capacity. This building, completed last year, was of the one-story, monitor-roof type, 100 ft. by 400 ft. and made possible an output of 1200 batteries a day.

put of 1200 batteries a day.

The two new additions recently completed are three stories each and form wings at either end of the plant built last year. The west building is 100 by 160 ft. with a floor space of 48,000 sq. ft. The east building is 100 by 200 ft. with a floor space of 60,000 sq. ft. Both additions are larger than the original building; thus the floor space again has been more than trebled, giving a floor space which now approximates 150,000 sq. ft.

All departments are being expanded

All departments are being expanded into the new wings, and when the greater facilities are finally in operation, which will be very soon, they will make possible an immediate increase of 50 per cent in the output of Prest-O-Lite storage batteries with plenty of room available for further expansion. The capacity will be increased to 1800 batteries a day, or at the rate of a half million a year.

million a year.

One of the new features in the east building is the company's installation of its own box manufacturing department. This department, now being equipped but partially in operation, will occupy the entire third floor, 20,000 sq. ft., where all Prest-O-Lite battery boxes will be made, fitted, branded and coated with a special acid resisting material. The second floor of this building is a vast storeroom for raw materials awaiting manufacture. The packing and shipping rooms are on the ground floor.

build 200 tires daily, and the company has orders ahead that will keep it busy for many months.

Ryan to Supervise for Ajax—W. J. Ryan has been made supervisor for the Ajax Rubber Co. in Minnesota, northern Wisconsin and the northern peninsula of Michigan with headquarters at Minneapolis, Minn.

Burst Is Promoted by Moon—Carl W. Burst, St. Louis, Mo., has been made general superintendent of factories for the Moon Motor Car Co. of that city, succeeding R. L. Cleveland, who has been made manager of the Chadwick Six factory. Burst took service with the Moon company nine years ago as a mechanic and worked his way up. For several years he has been purchasing agent.

Motor Concerns Join Trade Bureau—A foreign trade bureau has been organized by the Merchants & Manufacturers' Association of Milwaukee, with L. L. Newton of the Luther Grinder Mfg. Co., as chairman. The membership of the new bureau numbers more than 100 of the leading manufacturers of Milwau-

kee and includes Wisconsin Motor Mfg. Co., Sterling Motor Truck Co., Kempsmith Mfg. Co., Harley-Davidson Motor Co., Evinrude Motor Co. and many others affiliated with the gas engine and motor vehicle industry.

Tracy Takes Ohio Territory—W. R. Tracy assistant sales manager of the Oakland Motor Car Co., is going to Cleveland to take over the Ohio territory for the distribution of Oakland cars. A dinner was tendered to Mr. Tracy by executives of the Oakland company at the Detroit Athletic Club.

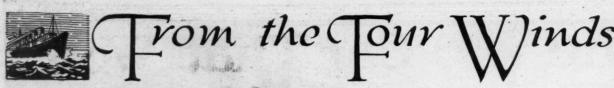
Liberty Loan Purchasers—Among those of the motor industry who purchased Liberty Loan Bonds are the United States Tire Co., whose employes subscribed for \$192,000 worth; the Reo Motor Car Co., \$210,000; the Hayes Mfg. Co., Detroit, \$89,250, or \$100 for every employe in the plant; the Kentucky Wagon Mfg. Co., \$30,750, and the Sims Magneto Co., \$39,400.

Ford to Help Sell Lighting Plant—The Lauson-Lawton Co., DePere, Wis., maker of individual electric lighting plants for farms, hotels and other buildings isolated from sources of current supply, has rigged up a Ford car with one of these units for the use of traveling salesmen for demonstrating purposes. Most of the solicitation is done in the country districts and the new plan is believed to be ideal for this work.

Boone Tire Begins Third Plant—The Boone Tire & Rubber Co., Sycamore, Ill., and Des Moines, Iowa, has awarded contracts for the construction of the first unit of its new factory at Chippewa Falls, Wis. The building will be of fireproof construction, 100 by 200 ft., and will be ready about Aug. 1 or 15. The company plans to invest between \$200,000 and \$250,000 in the new plant, which will be its third.

Gemco Adds to Double Capacity—The Gemco Mfg. Co., Milwaukee, Wis., formerly the Garage Equipment Mfg. Co., has awarded contracts for the construction of a three-story factory addition which will cost about \$100,000 with complete equipment. The new factory will enable the company to double its production of bumpers, shock absorbers, jack, lamps and other accessories and devices known under the Gemco trademark.

Oil Man Heads Motor Association—The Motor Trade Accessory Association has provided an oil administration for the coming year. Everett S. Marvin, vice-president of the Imperial Oil Co., has been elected president of the association, and A. C. Bauer, president of the Bauer Oil Co., has been elected vice-president. Other officers are: Treasurer, A. R. Baxter, Shurnuff Mfg. Co.; sergeant-at-arms, George Schattgen, Fisk Rubber Co.





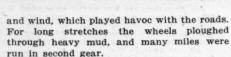


An Overland encounters a stretch of rough road when climbing a hill in Transvaal

> Not parking by a monument, but posing. The memorial is Siege Memorial at Kimberly, South Africa

This native ox sled met at a country trading station made the South African motorists appreciate their car





Tour State on Business-Mr. and Mrs. Joseph A. Schlecht, St. Louis, Mo., have started on a ten-day business tour of Missouri. Mr. Schlecht, who is president of the Mound City Buggy and Auto Co., will drive an Allen Classic car, and Mrs. Schlecht will drive a Jackson. The Mound City company is distributor for these two cars.

Turnpike Company Is Given Large Debt-The indebtedness of the Berks and Dauphin Turnpike Co. was increased from nothing to \$75,000 to comply with the order of the Pennsylvania Public Service Commission, which recently directed that the 26 miles of highway controlled by the company be improved. The necessity for improving the roads was agitated by motor clubs in Harrisburg, Reading and Palmyra.

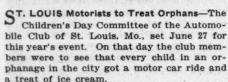
To Reduce Cost of Living-As a measure to combat the high cost of living, truck growers and farmers of Jefferson County, Kentucky, have suggested that motorists in their drives stop at a convenient farmhouse and purchase direct from the farmers all of their fresh vegetables. By such an arrangement the cost of "bunching" his products and of carrying them to market would be saved to the farmer and the customer would save on the purchase price.

To Wage Five-Year Road Campaign-The Kansas Good Roads Association has started a five-year campaign of road-building to convert land owners and tax payers to the advantages of 365-day roads and induce them to build same. The association is working with the state highway commission and the government in helping to get co-operation of Kansas in building improved roads and meeting the requirements of Federal aid. During the first four weeks of the campaign J. Frank Smith, president and general manager of the association, addressed fifteen meetings, which had an average attendance of 200 persons. The policy is to get the support of the commissioners and road boosters to some definite project of a few miles.

Motor Industry Syracuse's Biggest-Twelve factories devoted exclusively to the motor car business and many others devoted to the production of motor car parts make the motor industry the largest in Syracuse, N. Y. The factories employ 11,800 workers and have a yearly payroll of \$11,897,000. Syracuse is one of the largest steel cities, and a large percentage of the steel goes to the motor car factories, either for parts or tools and ma-chines. Last year \$2,500,000 was spent in factory additions and \$500,000 for new quarters for retailers.

Ohio to Revoke Licenses for Offenses-The most important of the laws passed by the last Ohio legislature is that permitting the courts to revoke licenses of owners who have violated speed laws, failed to stop after an accident or operated a motor vehicle while intoxicated. For the second offense the courts can revoke licenses for a period not to exceed two years. This is the most drastic provision against lawless drivers that was ever enacted in the Buckeye state and is effective July 2

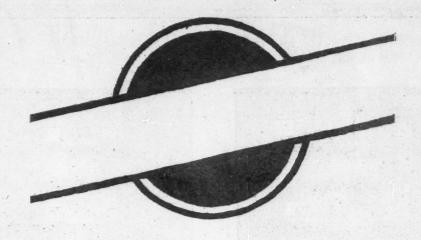
Garage to Give Hotel Service-A two-story garage is being erected for the M. & N. Auto Equipment Co. to specialize in hotel service. It will be called the St. Christophe Garage, the French name for the patron saint of motorists. George T. Burdeau, head of the enterprise, explains that the garage plans to take charge of a hotel guest's machine at the hotel door and to care for it while he is in the city and always have it at his call. A fleet of service cars will be maintained to assist guests who care to call to give special directions or for their disposal while their cars are undergoing repairs.



State Buys Toll Roads-Pennsylvania has bought the Cornwall turnpike, a 5-mile stretch of toll road between Lebanon and Cornwall, paying \$8,000. This purchase, following the agreement reached by the Berks and Dauphin Turnpike Co. to sell its toll road to the state for \$77,000, will free Lebanon County of the last of its toll roads.

Injured Racer Pilots Mitchell - Eddie O'Donnell, race driver, is making his second trip across the country driving a Mitchell six with one arm in a sling. O'Donnell was injured in the Kansas City speedway race July 22, 1916, and his broken arm has been very slow in healing. He made his first crosscountry trip in a Mitchell after getting out of the hospital and was on the road twelve days. This is his return trip.

Military Test for Oldsmobile-Previous motor car records from Los Angeles to Salt Lake City were shattered when Captain Owen R. Bird of the quartermaster's corps field service, accompanied by C. H. Bigelow, official pilot, Sergeants H. A. Baker and Roy Hamilton, driving a stock model Oldsmobile eightcylinder car, made the distance of 826 miles over the Arrowhead trail in 36 hours and 14 minutes. From the California line to Salt Lake the party was buffeted by rain, hail



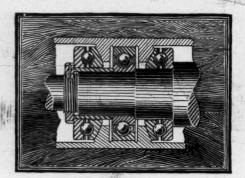
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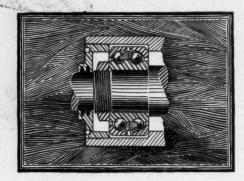
in this publication, one of the best known and most successful manu-

facturers of passenger cars and one-ton trucks selling under \$800, will make an announcement of PROFIT-MAKING significance to every dealer and distributor in this business who is looking for a broader, more productive field in which to capitalize fully his merchandising ability.

Watch for this announcement.

For advance information wire or write MOTOR AGE, 95 West Fort St., Detroit, Michigan. Inquiries marked "Confidential" will be answered direct by MOTOR AGE and so treated.





Here is economy — added efficiency too. Compare these installations and understand why the New Departure Double Row Ball Bearing has revolutionized ball bearing practice.

Compare the cost of bearings. The Double Row is obviously less expensive than the other three bearings.

Compare the cost of housings. The thrust washers must have spherical seats while the Single Row must be carefully fitted so as to "float." The Double Row housing need only be machined as for a conventional Single Row.

Compare the space occupied; less than half for the Double Row, an important consideration in many designs.

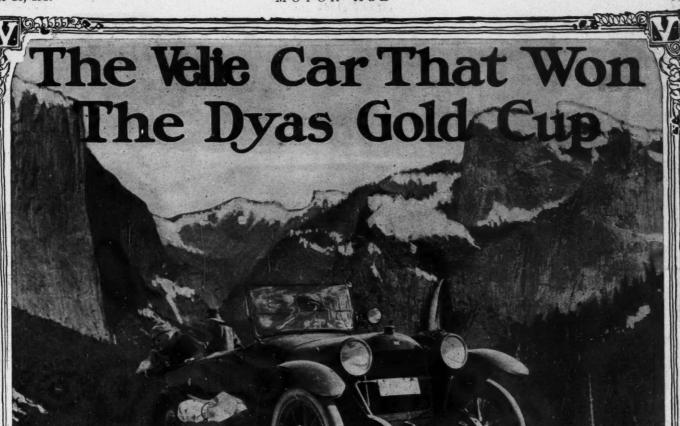
Compare the capacity. The Double Row resists an equal amount of thrust and from \(\frac{1}{3} \) to \(\frac{1}{2} \) more radial load.

Compare the adjustment. The Double Row is always in correct adjustment while it is difficult to maintain a correct adjustment and alignment with three bearing units.

Compare the action. You have true rolling motion at all times in the Double Row. Thrust washers are admittedly limited to low speed ranges.

THE NEW DEPARTURE MFG. COMPANY, BRISTOL, CONN.





First Car to Make the Famous Yosemite Valley Trip in 1917 Over the Wawona Road

AFTER a nine days' battle with snow, mud, fallen trees, rocks and cave-ins, the Velie Six Touring Car entered Yosemite Valley and captured the coveted Dyas Gold Trophy, offered for the first car from Southern California into the valley in 1917, over the Wawona Road.

The trip was made by members of the Lord Motor Car of Los Angeles with a Velie stock car, without any special or extra equipment. It met and conquered far more obstacles and hardships than any car in ordinary service will ever have to face. Thus the Velie values again demonstrated their superiority.

See and try the Velie. Then you will know why it takes the honors away from all other cars of

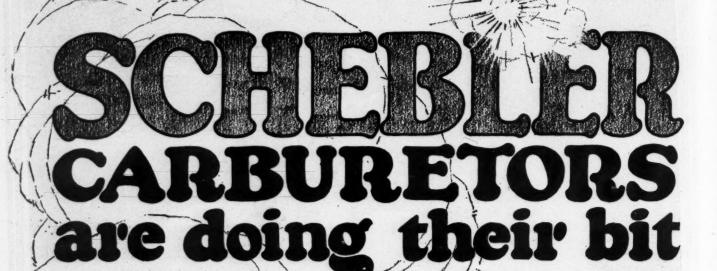
its class—in most miles to the gallon—in hill climbing—in smooth, confident, get-there performance on every kind of road—in longest service at lowest upkeep. On these values the Velie has never been beaten—even in years of competition with the highest-priced cars.

Eight body styles, Touring Sedan, two and four passenger roadsters, coupe town car. Prices \$1185 up. Write for our liberal proposition

VELIE MOTORS CORPORATION, 113 Velie Place, Moline, Illinois

Builders of Automobiles, Motor Trucks and Tractors

Velle Biltwell X



Have a Schebler Installed at Any of the Following Branches or Service Stations

Elyea-Austell Co., Atlanta, Ga.

W. J. Connell Co., Boston, Mass.

The Wheeler-Schebler Carburetor Co., 2021 Michigan Ave., Chicago, Ill.

Pennsylvania Rubber & Supply Co., Cleveland, Columbus, Akron, Ohio.

Ferris-Dunlap Auto Supply Co., Dallas, Texas.

The Auto Equipment Co., Denver, Colo. Herring Motor Co., Des Moines, Iowa.

The Wheeler-Schebler Carburetor Co., 876 Woodward Ave., Detroit, Mich. The Equipment Co., Kansas City, Mo.

The Equipment Co., Kansas City, Mo. Reinhard Bros. Co., Minneapolis, Minn.

Interstate Electric Co., New Orleans, La. James C. Nichols, Inc., New York City, N. Y.

New York City, N. Y.

Manufacturers' Supplies Co.,
Philadelphia, Pa.

The Automobile Accessories Co., Pittsburgh, Pa.

Ballou & Wright, Portland, Ore.; Seattle, Wash. Fred Campbell Auto Supply Co., St. Louis, Mo.

St. Louis, Mo.

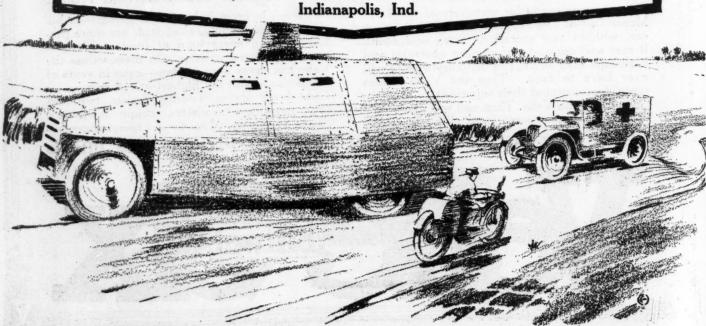
Weinstock-Nichols Co., San Francisco,
Los Angeles, Oakland, Calif.

Los Angeles, Oakland, Calif.

Canadian Fairbanks-Morse Co.
All principal Canadian cities.

Powell Supply Co., Omaha, Neb.

THE WHEELER-SCHEBLER CARBURETOR CO.



When Writing to Advertisers, Please Mention Motor Age



-Does ALL Farm Work -Fits ANY Size Farm

Here is the tractor you ought to sell. You can see WHY at a glance—it so completely fits any size farm—does anything horses will do—does work no other tractor will do—is so handy, practical, moderate in price—that every farmer in your community is a possible buyer.

You know the reason more farmers are not using tractors. It is because most tractors are too big—won't fit their needs—cost too much to buy and too much to operate. Then, won't do all farm work successfully, particularly soft ground work, corn or other hill and row cultivation. Not so with the one-man - all-work -

ORIGINAL

You can readily see that with this handy, compact, short turn, powerful power plant, even the 80 acre renter is a good prospect for you. Your opportunity for sales is practically unlimited. Read this 80 acre renter is a good prospect for you. dealer's letter — we have hundreds like it:

Back of all of these good reasons why the MOLINE UNIVERSAL is the tractor you ought to handle—JUST REFLECT ON THIS: It is built in the largest tractor factory in the world and backed by one of the oldest and strongest farm machinery manufacturers—a \$19,000,000 concern—who have "been at it" for over 51 years. That means first—a successful tractor—a big asset to you—a big talking point to your trade. Second—our 25 factory branches, located all over the U.S., assure "close-at-hand" factory service to both you and your customer. These features, together with those embodied in the tractor itself, you will readily see make it certainly "nuf sed." Write for terms, territory and particulars.

MOLINE PLOW

Mowers, Manure Spreaders, Seeders, Stalk Cutters, Far

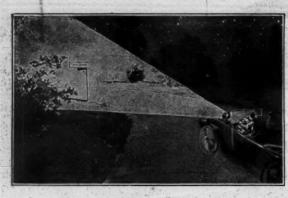








(D-2)



A beautifully finished high grade lamp, complete with every convenient feature: Universal adjustment, switch, road mirror, 21 c. p. nitrogen lamp.

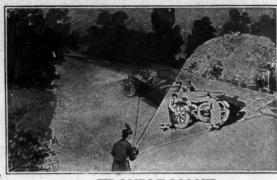


3. PLEASURE-LIGHT

Provides an abundance of light for auto-camping trips, picnics, motor boating, etc.

ANDERSON **AUTO-REEL** SPOT-LITE

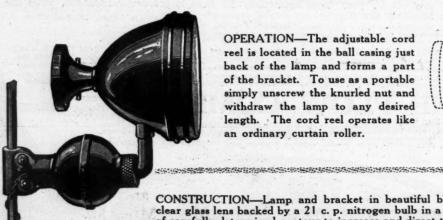
ALL IN THE REEL"



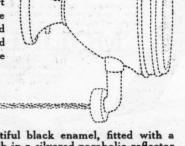
2. TROUBLE-LIGHT

Lamp is instantly removed from bracket and can be drawn out up to 12 feet, if required. No troublesome extension cords or connections to make always ready. Cord winds or unwinds automatically and stays "put" at any fraction of the cord length. Does away with the unreliable and weak pocket flashlight.

A Spot-Light with 3 Features in 1 Lamp: Spot-Light: Trouble-Light: Pleasure Light At no higher cost than any good ordinary spot-light



OPERATION-The adjustable cord reel is located in the ball casing just back of the lamp and forms a part of the bracket. To use as a portable simply unscrew the knurled nut and withdraw the lamp to any desired length. The cord reel operates like an ordinary curtain roller.



CONSTRUCTION—Lamp and bracket in beautiful black enamel, fitted with a clear glass lens backed by a 21 c. p. nitrogen bulb in a silvered parabolic reflector of carefully determined contour to increase and direct the light rays. An "on and off" switch of positive action, conveniently located at the back of the lamp, gives easy control. A 3½-inch reducing mirror, giving complete view of the road behind is an added feature, if required.

"AUTO-REEL" SPOTLIGHT

Cat. No. 3110—Without Mirror for rear view. Retail Price.....\$7.50 Cat. No. 3120—With Mirror for rear view. Retail Price.....\$8.00

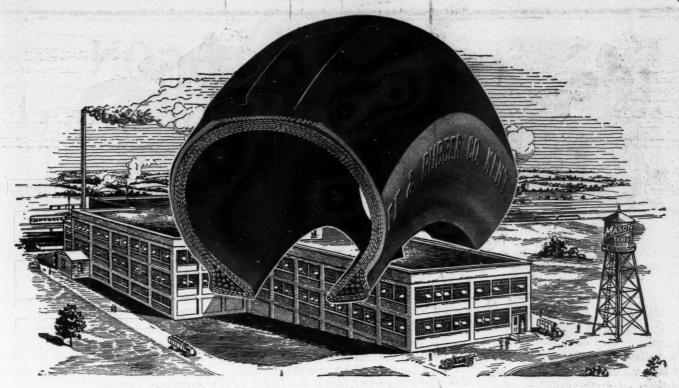
NOTE to JOBBERS and DEALERS—We make this an especially attractive line to stock, by including in each lamp carton 3 pairs of clamps—round, oval and rectangular—which will fit any size of windshield frame. User simply discards the two not required. Liberal discounts.

Sole Manufacturers and Patentees

Eastern Representatives: Hathaway & Knott, Inc. 120 Liberty St., New York

ANDERSON ELECTRIC SPECIALTY CO. 562-564 West Van Buren Street, CHICAGO

Pacific Coast Representatives: Western Agencies Co. 285 Minna St., San Francisco



Announcing the— MASON RIBBED TREAD TIRE

Mason has added a new and popular tread to its sturdy tire family—the snappy, black Ribbed Tread. Nowhere will you find a tire of greater distinction or superior qualities of endurance.

Like all Mason Tires, the Ribbed Tread tire is sold at a popular price. It includes every Mason feature—quality, materials, perfect craftsmanship, great resilience and tough wearing qualities. And there's nothing like it to give elegance to your car's appearance.

Equip your car with Ribbed Tread Masons and let your speedometer prove that Mason Means More Mileage.

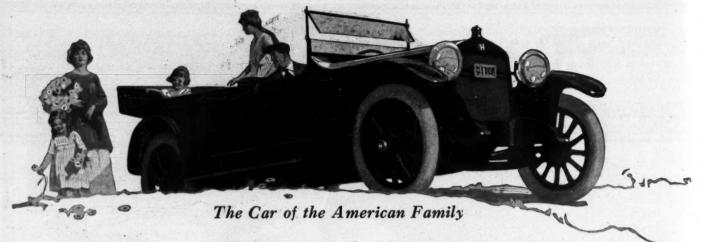
DEALERS—Here is a tire that is bound to be much in vogue. Write for further details and the frank Mason dealer plan that has won so many friends. A line to the factory today will bring worth-while information.

Mason Tire & Rubber Co. Kent, Ohio



Distributing Branches in Cleveland, New York and Kansas City

When Writing to Advertisers, Please Mention Motor Age



A National Reputation **Made International**

We believe the Hupmobile to be the best car of its class in the world. Evidence of an extraordinary sort supports this conviction.

The work it is doing the world over is nothing short of wonderful.

In Bombay, India, it has been given semi-official recognition.

Hupmobiles Kept; Other Cars Sold

No other car will be used there, hereafter, by the British govern-

At the end of the campaign in German East Africa, the British government sold at auction all the surplus motor cars in its possession.

These cars had been used in its war operations.

The government ordered, however, that all its Hupmobiles should be retained in service; and has since ordered several hundred more Hupmobiles for military use.

Border Performance Called Remarkable

On our own border, re-ports of Hupmobile performance are so remarkable that, for military reasons, propriety forbids their publication.

In the mountains of Mexico, Hupmobiles owned by the rebel chieftain Villa have borne the brunt of his road operations.

His representatives have sought, and been refused, two hundred Hupmobiles to be used as the backbone of their army transport system.

War Work Shows Greater Value

These evidences of rugged fitness for war work are merely sidelights, which make the greater value of the Hupmobile stand out in bold relief.

That greater value is in the service of the home.

Not without reason has the Hupmobile been called the car of the American family.

It is the car of cars for the domestic circle seeking service free from excessive cost.

Re-Sale Value Very High

It is economical because of its simple four-cylinder construction, standardized by years of progression.

It is rugged; it is superlatively smooth; and it is astonishingly swift in pick-up.

It asks no odds on any point of performance, from any multi-cylinder car it may meet in competi-on. It has a very high

re-sale value.

Year-Ahead Beauty Features

Over and above its reputation ruggedness, the new Hupmobile won recognition as the year-al beauty-car. The following are to all of its 25 new style features: Bright finish, long grain; French seam upholstery

Improved cushions and lace back springs in seats Leather-covered molding finish along edges of upholstery Neverleak top, black outside, tan in-side—waterproof

Tonneau gipsy quarter curtains, in-tegral with top

Bright leather hand grip-pads on Large door pockets with special weighted flaps Body a rew color—Hupmobile blue New variable dimming device, gradu-ates brilliance of headlights

New soft operating clutch Four Models—Two Chassis Five-passenger Touring Car, Roadster,
Sedan—119-inch wheelbase;
seven-passenger Touring Car
—134-inch Wheelbase

Safe, Sound, Sure Investment

From every angle, it is not only a most excellent and efficient motor carbut a safe, a sure, and a sound investment.

To repeat - now, more than ever, we believe the Hupmobile to be the best car of its class in the world.

Hupp Motor Car Corporation Detroit, Michigan

The New



This company's

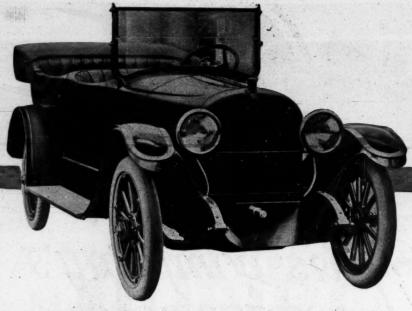
THE SHIP WITH

distributors' proposition is attractive enough to interest the largest and most important distributors in the country. Demonstrated merchandising ability and solid financial backing are two requirements.

See announcement next week

For advance information wire or write MOTOR AGE, 95 West Fort St., Detroit, Michigan. Inquiries marked "Confidential" will be answered direct by MOTOR AGE and so treated.





It Is Easy to Understand Why the Highest Priced Eight Cylindered Cars are Equipped with SPILLMAN MOTORS

SPILLMAN'8"

The SPILLMAN MOTOR has brought the eight-cylinder reputation up to its present high standard of excellence.

It has preserved all the smoothness and power of an "8," all the flexibility and ease of control of an "8"; and it has addedEasy accessibility to necessary parts, cooling and lubricating systems of a degree of efficiency unexcelled by any other type of motor.

The dominance of the SPILLMAN is

The dominance of the SPILLMAN is based on merit alone; it is based on actual performance under conditions calculated to extend any motor to the utmost of its powers.

Eights 31/4x5

Sixes 4x51/2

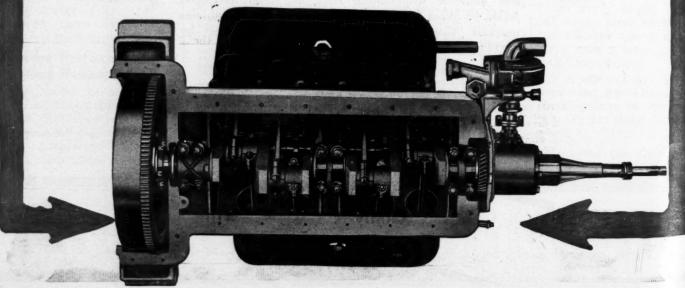
Fours $3\frac{1}{4}x5$

HERSCHELL-SPILLMAN CO.,

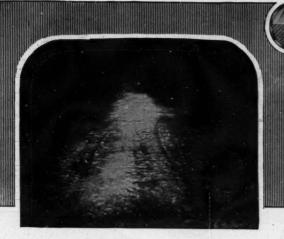
Builders of Automobile Motors

NORTH TONAWANDA

NEW YORK



When Writing to Advertisers, Please Mention Motor Age





How the road looks with plain lenses—and—with Totalux Roadliters at night

TOTALL ROADLITERS

Insure Your Own Safety First

Think what that means, now that the touring season, with its heavy night driving, is getting under way. A TOTALUX shows you the full width of the road and what is on it—every bump and every rut. Just as safe and pleasant driving by night as by daylight for there is a light like daylight on the road from fence to fence. No more fear of evening accidents—loads of anxiety taken off your mind, hours of enjoyable motoring added to each day.

Here's what they Stop

Danger of accidents from the blinding headlights of cars you meet.

Danger from being unable to see the road ahead of you clearly.

Giving "Glare Skunks" the whole road.

Making yourself a nuisance by throwing a glare into the eyes of the people you meet.

All need of dimming.



Totalux Roadliters Offer No Lodging Place for Dust or Dirt

The outside is smooth

Sizes	Per Pair
77/8", 81/4", 81/2"	\$3.00
8¾", 9", 9¼", 9½ 9¾", 10", 10¼"	3" 3.75
934", 10", 1014"	4.50
Special Roadlit	ters for
Fords	\$2 50

Here's what they Do

Light the road from fence to fence for a distance of 300 to

Enable you to pick out the good going, just as you do by daylight.

Keep the light ahead of the car below the level of your

Enable you to read the signboards as you pass.

Put all the light on all the

Try Them on Your Car for 60 Days

Try out TOTALUX ROADLITERS on your own car—that's all we ask. Remit for size wanted and we'll send you a pair by parcel post prepaid. If you prefer your money to the ROADLITERS, return them parcel post collect within 30 days—and back comes your money. You can't afford to take chances on the roads at night—when the way to end your trouble is made so easy.

TOTALUX ROADLITERS pierce dust and fog without back glare. With them you can always see just where

ASK YOUR DEALER, OR WRITE US DIRECT DEALERS, WRITE FOR LIBERAL OFFER!

TOTALUX CO. Colby-Abbot Bldg., Milwaukee, Wis.

Announcing the-

KIMBALL Non TIRES



DERBY

shipment.

BAR & BUTTON TREAD

BAR-GRIP TREAD

CORNER

Tire Business in Your Town The Best Territories Are Being Snapped Up. WRITE QUICKLY

Are You the "Live Merchant" of Your Town? Are You Prepared for Bigger Business?

The KIMBALL TIRE agency proposition means CAPITAL and BUSINESS to the wise dealer who gets it in his territory.

and BUSINESS to the wise dealer who gets it in his territory.

KIMBALL TIRES cost you about one-half the price of the lowest priced tire manufactured and give every dealer a splendid opportunity to carry on a prosperous cut-rate tire business and also compete with all the mail order houses.

and also compete with all the mail order houses.

The Largest Dealers in the country are taking advantage of this wonderful opportunity to get the KIMBALL TIRE agency. We allow only one dealer in a territory to handle Kimball Tires, and you may rest assured that every automobile owner will soon be purchasing KIMBALL TIRES from him. There is some extremely profitable open territory, offering remarkable opportunity to build up a big, sound and permanent business on KIMBALL TIRES.

It will be to your own best interests to write immediately for territory and PREPARE for BIGGER BUSINESS.

You

KIMBALI. NON-TIRES

TATAT			SKID		
Non-Skid. Tubes.				Non-Skid. Tubes.	
30x3\$	7.55	\$1.90	35x4	.\$17.35	\$3.30
30x31/2	9.85	2.15	36x4	. 17.65	3.35
31x3½				. 20.75	
32x3½				. 22.65	4.10
$34x3\frac{1}{2}$			36x4½.		4.15
31x4	14.25	2.95			
32x4	14.75	3.05	$37x4\frac{1}{2}$.		4.25
33x4	15.75	3.10	36x5	. 27.20	4.95
34-4	16.35	3.20	37×5	27.60	5.05

Do You Want Straight Side or Clincher?

All orders must be accompanied by deposit of at least 25 per cent or no attention will be paid to same. In order to insure quick delivery CASHIER'S DRAFT on Chicago or New York Banks, Express or Money Orders in part or full must accompany order. Allow us first and second choice on our Cord Type, Bar and Button, Derby Tread or Bar Grip Tread tires, in order to receive immediate

Dept. K, 1469 Michigan Ave. CHICAGO

Guarantee Protects

Do not hesitate about sending money in advance. WE ARE ABSOLUTELY RESPONSIBLE and GUARANTEE EVERYTHING to be as represented or your money back. As Uncle Sam does not allow fraudulent use of the mails, you are perfectly safe in sending your money in advance. Every Tire that we sell is absolutely guaranteed to be as represented or money refunded, provided the goods are returned to us within five days in the condition in which they were received.

Ly.
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all er re
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Water Is a Lubricant

-But You Wouldn't Use It in Your Crank Case

Why not? Because its lubricating qualities are not high enough to give efficient results. The same holds good of the oils you pick up promiscuously—they lubricate your engine, but not efficiently enough. They waste power and hasten engine depreciation. It pays to use only the best motor oil.

Tiolene

"The Motor Oil That's Clean"

You've seen statements like that before, haven't you? Let us show you why we can make that statement and prove it.

TIOLENE base is Pennsylvania Crude. Our own exact processes transform this into the perfect automobile lubricant.

TIOLENE is rigorously tested.

TIOLENE is free from all impurities and objectionable properties and is positively guaranteed by both the refiner and distributor. TIOLENE is obtainable in one and five gallon cans, but for the sake of economy and to insure having the best quality lubricant always in your crank case, we advise you to buy it by the drum.

You can get TIOLENE anywhere in 55 and 31 gal. steel drums. The steel drum is a complimentary feature with TIOLENE.

Tear off the corner and mail it to us today, asking us to give you proof why as an owner you should use TIOLENE—or as a dealer sell it.

TIONA OIL COMPANY

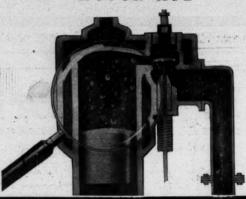
BINGHAMTON, N. Y.

FIONA OIL COMPANY, Binghamton, N. Y.

Kindly send full information and prices on Tiolene.

Name

Address



Are You Feeding Your Motor Raw Gas?

carbon deposits and causes misfiring, with lean and rich mixtures.

As long as you depend on ordinary carburetion of the vaporization of the fuel you are getting today-you are bound to waste power and keep

your engine in a bad condition as has been proven by tests made by carburetor experts with glass intake manifold.

Gas that has not been completely A GASCO GASOLINE ECONOvaporized wastes fuel, increases. MIZER is what you need to insure perfect vaporization, to effect a 25 per cent saving in gasoline bills and

a smooth running engine.

The beauty of the Gasco lies in its simplicity. Just insert it between the manifold and carburetor flange as shown in cut at bottom of page. It does the work for you at minimum cost by saving you gas and increasing your power and with

> least trouble in installation. Once in place it requires no attention.

> Tear off the coupon below. Fill it out and send it to us with a dollar bill.

We will guarantee you satisfaction. If the Gasco we send you doesn't do all we claim-send it back and we will refund the price.

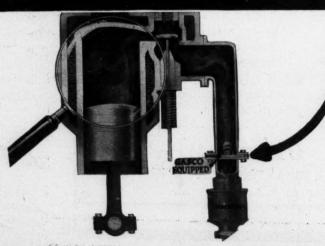
GASKET SUPPLY COMPANY 1727 Ludlow Street PHILADELPHIA, PA.

MANUFACTURERS OF GASKETS, PACKINGS. WASHERS, STAMPINGS, PUNCHES AND DIES

Cry the Gasco Way

MAIL THIS COUPON TODAY

GASKET SUPPLY CO., 1727 Ludiow St., Philadelphia, Pa. Gentlemen:—Send me a Gasco Econo mizer, subject to your guarantee, for month's trial. I enclose \$1.00, to be re turned if I am not satisfied.



When Writing to Advertisers, Please Mention Motor Age



Salient Six

The Car With The Versatile Engine

Recognized as the most advanced engineering achievement in present day automobile design.

An engine which is an effectual combatant of the low-grade gasoline available today.

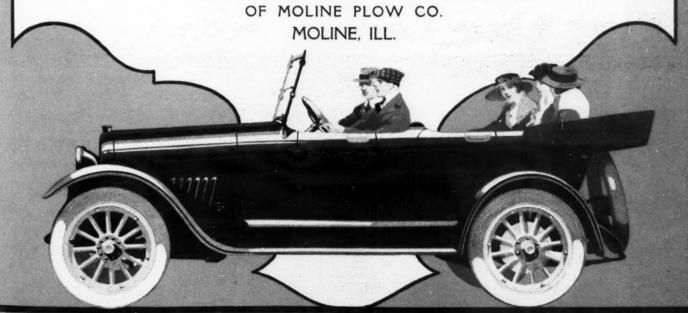
Piece by piece the greatest of six-cylinder engines, embodying the most approved features of leading types with an evident superiority in the design of the gas intaking system which obviates the prime objection to present types, namely, inability to burn all the gasoline.

This advanced engine in a chassis whose components are produced by the leading parts makers of the country. Mere mention of such names as Stromberg, Delco, Willard, Van Sicklen and Gemmer should convince you.

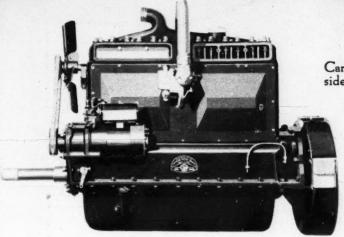
And on the chassis a body which is deep-seated, roomy, and conservatively distinctive.

The Stephens Salient Six car and its dealers are allied with a company of a fifty-two years manufacturing experience and \$19,000,000 paid-up capital.

STEPHENS MOTOR BRANCH

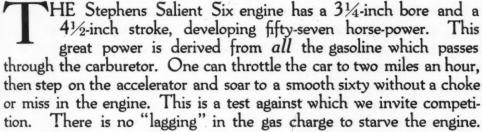






Carburetor bolted to the side of cylinder head

Valve Engine That the Gasoline



Another power factor is the overhead valve system which we believe to be the finest yet devised. Valve adjustment is a matter of a moment's work with a screw driver while engine is running, and the adjusting screws are on top of the engine within easy reach.

There are two valve springs instead of one. These springs are of different size. The result is that one spring checks the other with a shock-absorbing effect. Quick action without noise.

There are only three visible moving parts on the entire engine---the two fan pulleys and the belt. This complete enclosure makes the Stephens Salient Six a silent overhead valve engine.

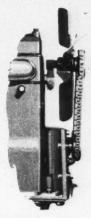
The crankshaft is in running balance, meaning that vibration is overcome and that in conjunction with the efficient gas administering and exiting feature, the engine is capable of extreme high speed.

The most positive type of lubrication, full force feed, is embodied in a trouble-proof oiling system which includes a pressure gauge on the dash.

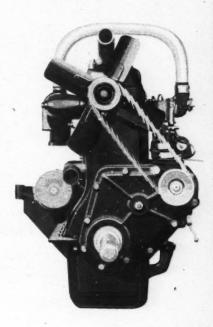
IT BURNS ALL THE GASOLINE.

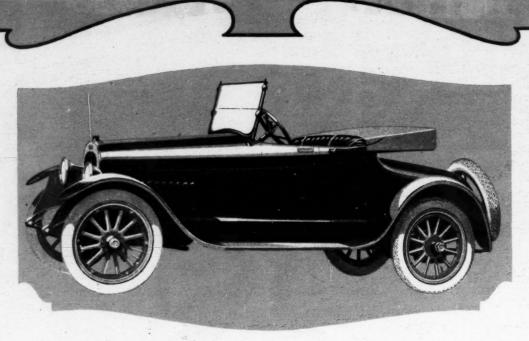
OF MOLINE PLOW CO.

Sales Office: MOLINE, ILL.



Only three visible moving parts on the entire engine





Two Striking Body Types

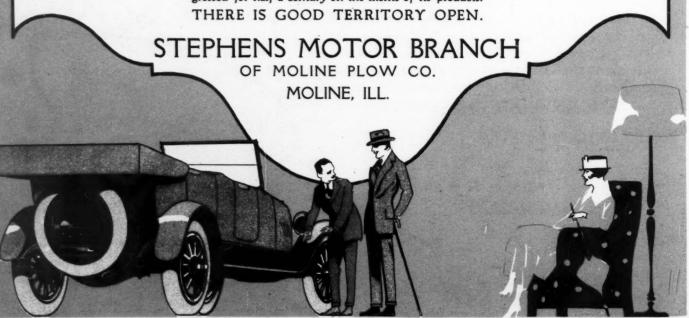
ATOURING CAR with swift, graceful lines. Five-passenger comfort suspended on sensitive springs. The seats are deep set in the body and luxuriously sprung. A three-passenger roadster. Three large people may be seated on the one sociable cushion.

Both types have deep, soft, French-piped Turkish upholstery. Both have ventilating, rain-vision windshield. Both have Van-Sicklen speedometer and Kellogg tire pump driven from transmission. Both have electric motor-driven horn with push button on top of the steering column.

The wheelbase of both models is 118 inches and the price \$1385 Freeport, Illinois.

DEALERS—There is a most attractive proposition for you.

This type is a superior of a successful predecessor. It is manufactured by a company which has lived and progressed for half a century on the merits of its products.





At Last! A Really Satisfactory Jack

The REES Jack is a worm drive jack. It lifts steadily—not by jerks. It is irreversible and cannot slip back; it does not run out when inverted.

You can stand up when operating it. You do not have to stoop and crawl even when placing the jack. The long handle (folded up when not in use) enables you to place it and operate it from a distance, as illustrated.

It is the safest and most powerful auto jack made. Its worm gear construction is endorsed by leading engineers as the most efficient method of applying power to a jack.

And it is no larger nor heavier than other jacks. It fits your tool box, handle and all.

The REES was born and developed in railroad yards, lifting freight cars and passenger coaches. Lifting an automobile is play for it—and play for the REES owner.

No autoist can see the REES Jack work and not buy one, if he has the money. He *knows* it is what he wants.

The jack is simple in construction. Only 4 working parts. No springs, pawls, or ratchets.

The handle is connected to jack by universal joint. Attached and detached by a twist of the fingers.

\$8.00



Rees Jack folded, ready for tool box

A Big Dealer Opportunity

This jack has it over other jacks "like a tent"! Autoists buy it the minute they see it work. Selling at the same price as other jacks, there is no comparison in value. It is a per-

fect cinch to sell.

There is a good profit in it, and we can give you immediate and complete deliveries.

Wire or write us at once, giving the name of your jobber, and we will send you full information concerning the REES Jack and what it means to YOU! Get Busy—TODAY!

The Service Corporation

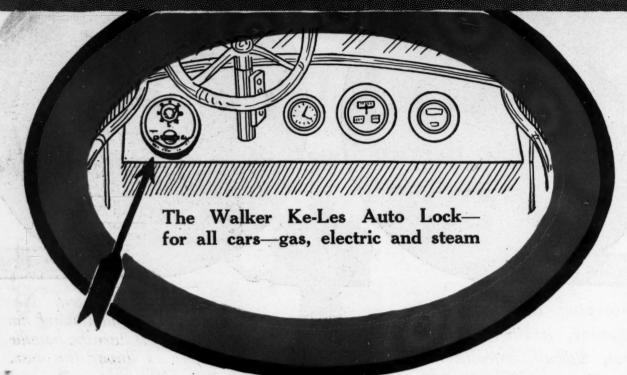
Frick Annex,

Pittsburgh, Pa.



Interior view. Only four working parts

OTHIEVES



Cuts Off Gasoline, Battery Magneto and Self-Starter

OCK your car with the Walker Ke-Les Auto Lock, and it's as safe as any secret in your brain. No key of any kind is used. The Walker Ke-Les works on a combination principle. You set your three-number combination and you're the only one who can start your car. Over 87,000 changes to the combination.

Money Refund

Guarantee

We absolutely guar-

antee that the Walker

Ke-Les Auto Lock is perfect as to material

and workmanship. We further guarantee that each and every Walker

Ke-Les Auto Lock

will positively do everything we claim

for it or your money

refunded.

A turn of the wrist Locks Your Car

A turn of the knob to three numbers and your car is unlocked. Just a couple of seconds. The Walker Ke-Les locks and unlocks quicker than you could find your key.

A key lock invites tampering. The Walker
Ke-Les lock defies it. One glance at the lock is

enough to drive any thief away. Change the combination as often as you please. You can do

A slight turn of the wrist cuts off the gas, battery, magneto and self-starter. No one can steal your car. No one can drive it away. The Walker Ke-Les is easily locked or unlocked in the dark.

Over 3,500 already in everyday use. You're not buying an experiment.

Will last a lifetime

A marvel of simplicity is the Walker Ke-Les Auto Lock. Just a few parts. No springs to weaken. No complicated mechanism or tumblers—just smoothly operating, noiseless discs—positively can't get out of order.

Sets flush with the dash or instrument board,

same as speedometer. Right in front of the driver. Can be installed on any car-gasoline, electric or steam.

WALKER KE-LES LOCK CO., CHICAGO, U. S. A.

JAMES H. CUMMING, Sales Manager

When Writing to Advertisers, Please Mention Motor Age

NOW FOILED!!

NO KEY

to lose or leave in the lock— No keyhole to find



\$10

(\$15 IMMEDIATE DELIVERY!

Properly Installed)

The small sum of \$10 renders your car absolutely safe from theft. That's the price of the Walker Ke-Les Auto Lock—only \$10. Have a Walker Ke-Les Auto Lock put on your car today. Go to your regular accessory dealer or to any good garage or auto supply store. If the dealer is not yet supplied, send direct to us. Use coupon below.

Save Your Car!

"Walker Lock" it without delay!

Organized bands are stealing automobiles everywhere, changing their appearance and shipping them to distant cities. Thieves may now be "laying" for your car. It's liable to be stolen any hour of the day or night. SAVE IT! Put on a Walker Ke-Les Lock and laugh at auto pirates.

FIRE! The Walker Ke-Les Auto Lock absolutely prevents "backfire" setting fire to your car.

It also complies with the Insurance, Police and Fire Department requirements with respect to cars standing in the street.

Write Today! Learn all a b o u t this marvelous Auto Lock. Mail the coupon or postcard for full description. Do so today. Don't put off this important step. Better be safe than sorry. Mail the coupon at once!

WALKER KE-LES LOCK CO., CHICAGO, U. S. A.

A Word to Dealers

No matter what your experience has been with so-called "Auto-locks," you will find the Walker Ke-Les to be the right thing. It's bound to be one of the largest sellers in accessories ever brought out.

We can supply you in any quantity promptly.

No disappointments. No delays.

Write for our proposition—TODAY!

"Tell Me About It" Coupon

Walker Ke-Les Lock Co.
Dept. B, Cunard Bldg., Chicago, Ill.
Gentlemen: Without obligation on my part,
please send me postpaid free, your booklet telling
me all about the Walker Ke-Les Auto Lock. I

Name and Address

AUTO LOCK \$10°°

When Writing to Advertisers, Please Mention Motor Age

In the East-

MOTOR AGE

the New England and North Atlantic States—there will be open for the first time to big distributors, several of the most fertile selling fields for these well-known cars and one-ton trucks. This territory will be allotted with discrimination and care. Applicants must qualify.

See announcement next week

For advance information wire or write MOTOR AGE, 95 West Fort St., Detroit, Michigan. Inquiries marked "Confidential" will be answered direct by MOTOR AGE and so treated.



Are You Building For the Future?

Selling automobiles is a business—and business men look to the future.

Future sales in every line depend largely upon the satisfaction given by the goods you are selling today.

Haynes dealers have doubled, tripled, quadrupled their sales within the last few years—on the strength of owner satisfaction.

They claim a larger percentage of re-sales on the Haynes than any other car.

Satisfaction — entire fulfillment of the owners' expectations—is the reason and cause for this claim.

Year after year Haynes dealers are building bigger businesses; year after year their old customers return, in astonishingly large numbers, and re-buy Haynes cars.

Perhaps there is an opening in your territory. Write for our proposition—this action places you under no obligation whatever.

The Haynes Automobile Company

2 South Main Street

KOKOMO, INDIANA



The Way You Clean Is the Way

When you can't reach through the neck of a bottle to clean the inside, if you drop in ordinary shot, and shake the bottle—the shot will do the rest.

That's the principle of the D & D FOULESS Self-Cleaning Spark Plug—the new \$2 Spark Plug with the ball. Instead of having one or more small separate wire terminals, the end of the FOULESS

Spark Plug is formed in the shape of a slotted chamber or cage. In this cage is a movable ball, kept in motion by vibration.

In this cage is a movable ball, kept in motion by vibration.

The continual movement of the ball keeps the terminals absolutely clean and clear of oil or carbon—knocks off the soft, flaky carbon before it hardens and cakes. The FOULESS ball does everything for D & D Spark Plugs that shot does for the bottle it cleans—and it goes the shot one better.

D & D COMPANY

a Moving Ball Keeps the FOULESS FIRING SURFACE CLEAN



Bottles with Shot Cleans Itself

PLUG The Plug with the Ball

th

S

e.

The movable ball of the FOULESS, in addition to its value as a cleaner, acts as an in-built intensifier for D & D-the \$2 Plug. It gives a double spark-from the electrode to the ball, and from the ball to the wall of the sparking cage -intensified to such a degree that it will ignite a gas charge so lean that other plugs would utterly fail to fire it.

And in the face of this hotter spark—the sure-fire D & D Spark of economy—the FOULESS \$2 Spark Plug cannot burn out. The continual movement of the ball distributes the spark, keeping dozens of firing points at work, instead of one. Its scattered fire-more highly efficient than any other-never hits twice in the same spot. It will never burn out.

D & D Spark Plugs bring users quality, economy and service. They belong under the hoods of every kind of car.

USE THE COUPON NOW for free illustrated literature, or send \$2 and your dealer's name for trial plug.

Dealers Get Our Liberal Business Offer

20 EAST JACKSON Chicago BOULEVARD

Use the Coupon Now

D & D COMPANY, 20 E. Jackson Blvd., Chicago.

Send me free illustrated literature and complete details regarding FOULESS-the new \$2 Spark Plug. (If \$2 is inclosed, trial plug will be shipped at once.)

1ddress

My dealer is..... Dealers check here
and attach coupon to your business letterhead for additional advance information and discounts.

When Writing to Advertisers, Please Mention Motor Age

The state of the state of the National BRIS





DEALERS:

The Saturday Evening Post Announcement of Briscoe Week will be distributed in your territory July 5th.

This means a great opportunity to open the local exhibit Saturday, July 7th, and cash in on immediate sales. The new Briscoe, with its surprising features, will prove the greatest business-magnet you've ever known.

You may still be able to conduct the exhibit if your territory has not already been closed.

WIRE now for complete plan.

EXT week is Briscoe week in 1000 showrooms! Briscoe B4-24 models are, we believe, the best looking, the sweetest running automobiles in the field of light cars.

They are distinctive; meadow-green bodies, black fenders, filler aprons and cream colored wheels—the only light cars in which your pride is gratified by the distinctive looks of body and gear in different colors.

Ride behind the Half-Million Dollar Motorhaustible power in this model. Building it entirely in our own factories makes possible the low price of \$725.

ANOTHER WAY

to know the Briscoe; read the complete story as told in the Half-Million Dollar Motor Book — write for it today.

Touring Car \$725 4 Passenger Roadster \$725 Delivery Car \$725 and \$750. F. O. B. Jackson Prices Subject to Change Without Notice

Features

Half-Million Dollar Motor; Bore 3 3-16 in.; Stroke, 5% in.; detachable water cooled cylinder head; Valves com-pletely enclosed.

Wheel Base—105 inches. Rear Axle—Floating type. Front Axle — I-beam sec-tion drop forged. Lubrication — Oil pump, splash system.

Carburetor-Automatic. Tires—30x3½ in.; non-skid in rear.

Springs—Full elliptic, front and rear.

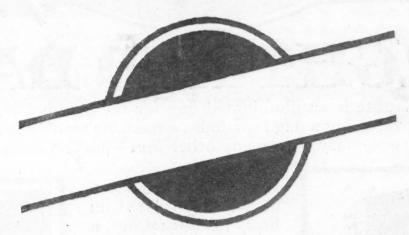
Prices subject to change without notice.

BRISCOE MOTOR CORPORATION JACKSON, MICH.

This manufacturer

has always recognized the important status of its dealers. Meeting the dealers' increased cost of doing business by increasing its dealer discount, was no more than appreciation of the fact that dealer loyalty and goodwill is a company asset.

See announcement next week



For advance information wire or write MOTOR AGE, 95 West Fort St., Detroit, Michigan. Inquiries marked "Confidential" will be answered direct by MOTOR AGE and so treated.

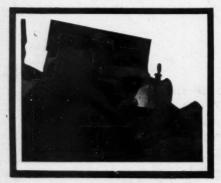
RRISE

SHOW YOUR COLORS



NIGHT AND DAY

Flaglite is an illuminated flag for the automobile, not a novelty, but a flag spot-light, a roadside trouble lamp and an accessory with many other uses—plus an endless life.



As an inspection light

A silk flag, a brass parabola, silver-plated on brass inside and out, a bracket of cold rolled steel with baked hard rubber finish—a construction which cannot be improved upon.



BE FIRST TO SELL FIAGLITE

The Illuminated Flag Holder

Live dealers see the merit of *Flaglite* at once. The illustration on the opposite page shows better than any description. Here at last is a flag-holder in keeping with the feeling of patriotism that is leading every motorist to display the national colors on his car.

Beautifully Finished

Flaglight is no haphazard hook-on device that cheapens the feeling that prompts its use. It is a highly finished, rigid, unbreakable attachment that can be clamped to the radiator cap and wired in a few minutes. Once attached it will not wabble, slip or break, but remains firmly in place.

Flag Always Illuminated

Right under the flag standard, protected from dirt and rain by a glass cover, is a miniature headlight, pointed upward and built on the principle of the famous flood lamps used in illuminating flags on our public buildings. Other uses such as the illumination of the Moto-Meter or radiator emblem, or as a trouble lamp, are simply additional selling points for the wide-awake dealer's salesman.

Opportunity Is-NOW

Flaglite, packed carefully in a cardboard carton, sells for \$2, and our discount to dealers is liberal.

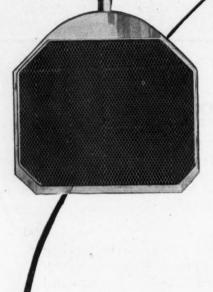
The demand for Flaglite is big now wherever it has been introduced—but it is going to be enormous. Write us at once, while we can take care of you. A wire will secure quicker action.

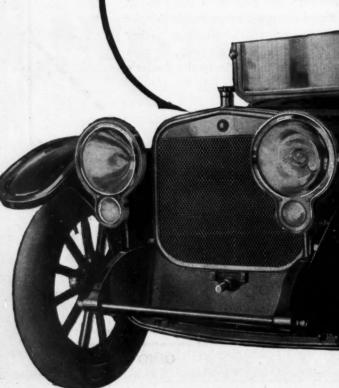
The Flaglite Company
Schofield Bldg.,
Cleveland, Ohio

Flaglite Sales Corporation 1790 Broadway New York City Flaglite Company
Schofield Bldg.,
Cleveland, Ohio
or 1790 Broadway, New York City

Please send me at once, details of your big moneymaking discounts for dealers on laglite.

The Radiator identifies the car



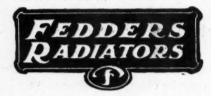




DISTINGUISHING radiator individualizes the car on which it is placed. It enthat car with a personality

dows that car with a personality that cannot be overlooked—enables the interested onlooker to instantly choose from all that pass—the car equipped with a Fedders Radiator.

The radiator is the face of the car. No other one feature adds more to the appearance or expresses more character. And while Fedders Radiators blend perfectly in the building of a car of utmost beauty of design, in still greater degree they contribute to the perfect operation of that car.



Through 13 years of radiator manufacture "Fedders" has stood for sterling worth. In the gruelling test of racing service they have won and hold unequalled honors.

Their continued use by the makers of the highest grade cars through a long term of years is proof positive of their inbuilt quality.

Fedders Radiators dominate the Motor Truck field. No greater endorsement could be attained than the fact that Fedders Radiators have for years met the exacting demands of commercial car service.

FEDDERS MFG. CO., Inc. BUFFALO, N. Y.



The Motorist who is Brunner-wised—
Speeds smooth-with danger minimized
Because his tires are Brunner-ized—

The pleasures of motoring are enhanced and the dangers are minimized when tires are properly inflated—smooth rides with danger of blow-outs lessened are insured by Brunner Service—and that is why the Brunnerwise Motorist patronizes the garage displaying the Brunner Sign.



Ever since the garage business has been a business the Brunner Air Compressor has been consistently demonstrating its sterling worth to the garageman —in the garage. Year after year the demand for Brunner Air Compressor Equipment has been doubling over, simply because the Brunner Air Compressor has always stood up and given satisfactory service. The motorist who patronizes the garage displaying the Brunner Sign always finds an ample supply of clean, cool air at the proper pressure to inflate his tires correctly at his disposal.

The Brunner Sign Attracts the Trade of the Brunnerwise Motorist

Because he knows that the garage displaying the Brunner Sign is always prepared to render him prompt and efficient compressed air service—he knows that when he pulls up under the Brunner Sign he never has to drive away disappointed.



He realizes that clean, cool air, such as he always finds at his disposal under the Brunner Sign, will increase his tire mileage and will reduce the dangers of motoring to a minimum. That is why the trade of the Brunnerwise Motorist follows the Brunner Sign.

The Safe Way Is the Brunner Way

The Brunner Air Compressor has always proven true to the Jobber who sells it—the Garageman who buys it—and the motorist who uses it—are you Brunnerwise?

The Garageman who buys Brunner Equipment is never disappointed for the reason that it has never been necessary to resort to misleading advertising claims in order to bolster up the sale of Brunner Equipment and the garageman purchasing Brunner Equipment always receives just what he expects and "a little bit more."



INVESTIGATE THE BRUNNER AIR COMPRESSOR

Be honest with yourself and investigate the garage air compressor question thoroughly before deciding on your new equipment. The Brunner will stand investigation and the more thorough the investigation the more certain will be your decision in favor of Brunner Service, because it not only insures compressed air efficiency of the very highest order, but it also insures that very desirable and liberal patronage of the Brunnerwise Motorist, which follows the Brunner Sign.

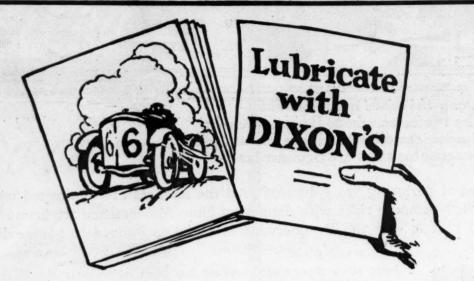
We will be glad to send you the name of the Brunner Jobber who covers your town, also our catalogue and Garageman's Handbook on Compressed Air—a book which every garageman should read carefully. They are all free for the asking.



BRUNNER MANUFACTURING COMPANY

Main Office and Plant: UTICA, N. Y. Cincinnati Branch: CINCINNATI, OHIO





Take a Leaf From the Racers' Book

Once more a Dixon-lubricated car has demonstrated Dixon dependability. Earl Cooper, winner of the 250-mile Chicago Speedway Derby, says, "Dixon's Graphite Automobile Lubricants are about as necessary to a racing car as gasoline."

PIXON'S GRAPHITE S Automobile LUBRICANTS

have won the following "firsts" this year:

Driver	Car	Track	Date
Billy Taylor	Newman Special	Uniontown, Pa.	May 10
Louis Chevrolet	Frontenac	Cincinnati	May 30
J. P. Fetterman	Peerless	Uniontown, Pa.	May 30
Dave Koetzla		Detroit (dirt track)	May 30
Earl Cooper	Stutz	Chicago	June 16

Not only have Dixon's been used in the winning cars, but nearly every contesting car was kept Friction-free by Dixon's. Practically every racing driver of note uses Dixon's regularly. The drivers demand the very best for their cars and they are in a position to get it. The superior lubrication is the reason for their choice of Dixon's and the repeated Dixon victories are proof of that superiority. Here's something for the everyday driver of pleasure or commercial cars to remember: Dixon's prevent that metal-to-metal contact which makes Friction, and Friction spells ruin to your car. Get rid of Friction by lubricating with Dixon's.

Write Department 82 for the Dixon Lubricating Chart.

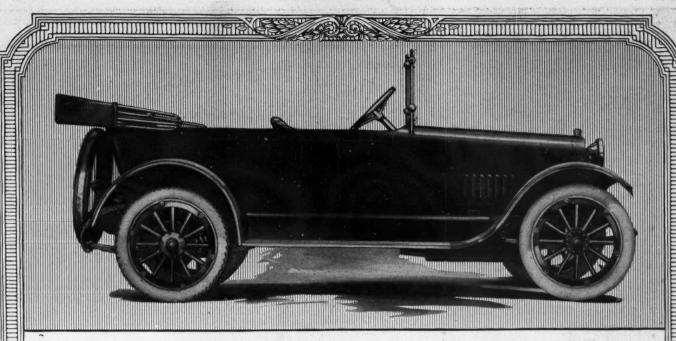
JOSEPH DIXON CRUCIBLE COMPANY

JERSEY CITY, N. J.



Established 1827





What's Under the Hood?

How do you judge a car? By its appearance—its clever advertising, fine body lines, upholstery and appointments—or by its specifications and what it will do? What's under the hood? That is a question of the utmost importance to every prospective car owner. An automobile is only as good as its weakest unit. One faulty part destroys the efficiency of the entire car.

GLIDE "LIGHT SIX" \$1295

The reputation of the Glide Six was established by performance—not promises. It has given steady, satisfactory service on all kinds of roads and under all sorts of conditions. The Glide is not merely a show car for city boulevards but has the strength, power and endurance necessary to climb steep hills and negotiate rough country roads.

The Glide is handsome in design with graceful yacht-line body, luxurious upholstery and refined appointments that give pride of ownership and automobile comfort.

Write Now

For Complete Specifications and Agency Proposition

A comparison of the Glide specifications with those of any other "Six" will prove beyond a doubt that the Glide is the best "Six" at the lowest price for which a car with Standard Specifications and as complete equipment can possibly be produced.

SOME GOOD TERRITORY FOR THE GLIDE "SIX" STILL OPEN. WRITE FOR DEALERS' PROPOSITION, COMPLETE SPECIFICATIONS AND LITERATURE.

THE BARTHOLOMEW COMPANY, 300 Glide St., Peoria, Illinois

HESS-BRIGHT

HESS-BRIGHT BALL BEARINGS

HOW TO APPLY THEM

THE CARE OF BALL BEARINGS



THE HESS BRIGHT MANUFACTURING COMPANY PHILADELPHIA, PA.

SEND FOR THIS NEW LITERATURE

The Application of Ball Bearings to the Airplane

IESS-BRIGHT MANUFACTURING CO. PHILADELPHIA, PA.

> THE HESS BRIGHT MANUFACTURING CO. PHILADELPHIA, PA

HESS-BRIGHT MFG. CO.

Rust Proofing the Motor Car Industry

DARKER IROCESS



PARKER PROCESS has proved its worth

The results which have been secured by over one hundred and fifty motor car and motor car accessory manufacturers justify this more general solicitation for recognition of the PARKER PROCESS by the motor car industry.

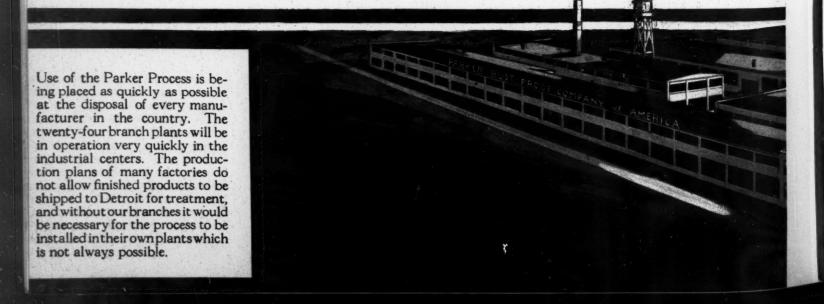
Without exception, where the question of the prevention of corrosion is the desired end, those manufacturers who have tried the Process have renewed their contracts, not only for the parts on which the treatment was tested but in many cases for various other parts which need this protection.

The PARKER PROCESS has enabled manufacturers in many instances to substitute steel and iron for more expensive non-corrosive metals. The saving afforded in this way can hardly be estimated,

One of the highest quality cars produced in America now has 283 parts treated with the PARKER PROCESS.

The most prominent engineers in the industry have studied the PARKER PROCESS carefully, subjected it to the most rigid tests, and it has yet to be found unsatisfactory for the parts for which our chemists recommend it.

We ourselves can hardly realize the tremendous importance of these statements we are making here. It is hard to believe that such a process has proved its worth in this way, but we are stating simple facts which we know will be to your great advantage to investigate.





What the PARKER PROCESS is—

Any form of iron or steel construction may be treated.

The parts are cleansed either by sand blast, soda wash or other simple means, then placed in a vat containing the PARKER PROCESS solution. This is maintained at a temperature of 212°—they are left in this solution until the chemical reaction ceases, the time varying from one to three hours.

This treatment is not what would be considered a coating process, but becomes more nearly an actual part of the metal.

After the metal is taken from the solution it is then immersed in an oil bath, which is a special formula for this purpose. This oil bath is intended to neutralize the chemical action and make it permanent. The finish left is a deep, flat black, which will take enameling, varnishing or painting advantageously if such other final finish is desired.

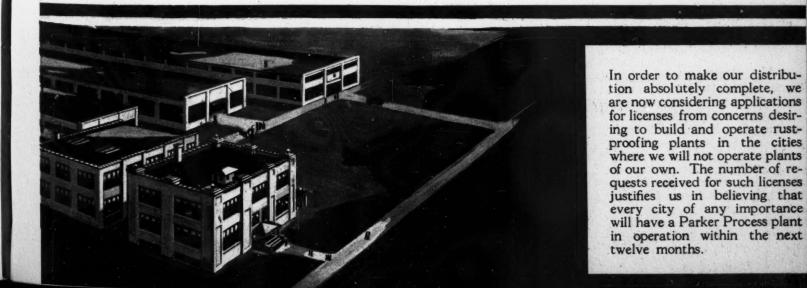
This process does not change the dimensions of the most delicate models. It has no effect whatever on sharp edges or screw threads, and the temper and resiliency remain unchanged.

Articles may be successfully treated either before or after assembling.

The PARKER PROCESS, although the only really effective method of preventing corrosive action, is also less expensive than any other treatment.

The remarkable efficiency of the PARKER PROCESS makes it possible to substitute iron and steel for brass, copper, bronze and aluminum.

It is an interesting fact that the Parker Rust-Proof Company of America not only own all fundamental patents on rust-proofing as distinguished from metal plating, but all basic patents on the vats and other apparatus used.





DARKER IROCESS



About the Parker Organization—

The plant at Detroit is now capable of handling two hundred tons of metal per day.

Twenty-four other plants are at present being planned: One at Cleveland is already in operation.

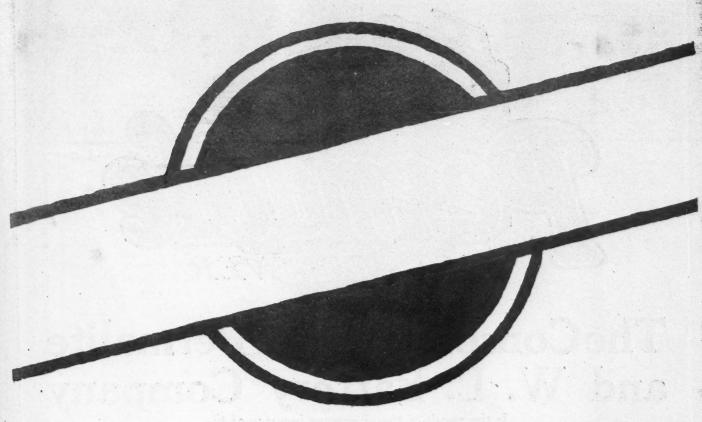
Manufacturers may send their metals either raw or finished and assembled to one of our plants, or secure a license to operate the process in their own plants.

We ask an opportunity to demonstrate to you on your product just what the PARKER PROCESS will mean to your output. You are invited to test it in any way you wish, to make it prove its worth to your entire satisfaction.

A visit to our plant and a consultation with our engineers may bring out a definite way in which the PARKER PROCESS will prove profitable for you.

PARKER RUST-PROOF COMPANY OF AMERICA DETROIT

Six Trucks Required For Detroit Deliveries.



to supplement its passenger car—both selling below \$800—is a feature which makes this company's dealerships and distributorships unusually attractive.

See announcement next week

For advance information wire or write MOTOR AGE, 95 West Fort St., Detroit, Michigan. Inquiries marked "Confidential" will be answered direct by MOTOR AGE and so treated.



The Consolidation of Permalite and W. L. Battery Company

Is the result of the enormous increase of the National Storage Battery Exchange Service

We have been proving constantly that Permalite is the greatest advance in years in convenience to the motorist. It has been necessary to add to our equipment to meet the growing demand for Permalite, with the result that we have secured, for life, the services of Mr. Frederick Wright, a genius who has been responsible for the success of more than one storage battery, and the factory of the W. L. Battery Company, at Poughkeepsie, N. Y. This large, modern plant, and, back of the plant, Mr. Wright, will enable us to supply our customers more promptly. The quality that has been built into two distinct batteries will now be built into

Permalife

"LASTS FOREVER"

THE NEW NAME OF THE ONLY NATIONAL STORAGE BATTERY EXCHANGE SYSTEM will more accurately express the spirit of our service—that from the standpoint of the motorist, Permalife lasts forever—and will avoid confusion with automobile accessories with similar names.

DEALERS, ATTENTION:

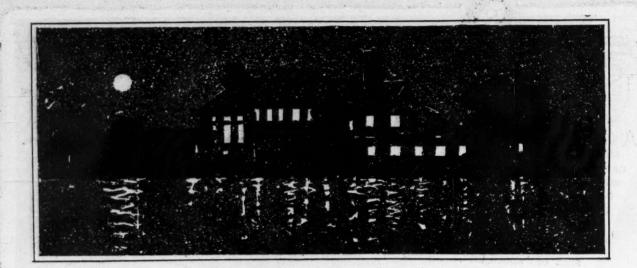
Permalife merchandising plan is the most astounding Battery proposition ever offered the motorist

Do you remember what it meant to have the first guaranteed tire? Here is another sensation in the automobile field that is sweeping the country. Permalife is the first real guaranteed storage battery—the battery that never wears out, from the standpoint of its service to the user. It put money in his pocket as well as yours. You can control the battery business in your territory with Permalife. If there is no Permalife dealer in your town, wire Dept. M A-7 at once for our unusually attractive proposition.

Permalife Storage Company, Inc.

Factory and General Office: Poughkeepsie, New York General Western Office: Indianapolis, Indiana Service Stations and Exchange Depots Everywhere





That Summer Home-

VOUR summer home, lighted and supplied with electric current by means of a Genco-Light Light and Power Plant, will yield you more than double the pleasure you got out of it last year.

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It doesn't matter where your summer home is, in the country, mountains or seashore, the Genco-Light Light and Power Plant is what it needs to complete your vacation comfort.

The Genco-Light Plant will light it effectively and cheaply, and at the same time help in a multitude of other ways such as recharging the storage batteries of your car or motor boat; furnishing power for a vacuum cleaner; operating a washing machine; churn or farm machinery; or running a lathe or-other tools in your shop or garage.

The Genco-Light Light and Power Plant consists of a specially designed self-starting, gasoline-kerosene engine practically noiseless and vibrationless, coupled directly to a generator which feeds a 16 cell storage battery.

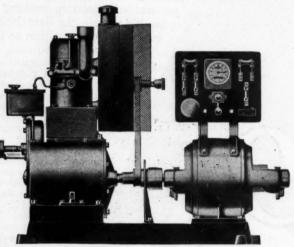
This splendid piece of machinery is so simple that a woman can operate it. It has been made so safe that a child cannot hurt himself with it.

WE WANT DISTRIBUTORS

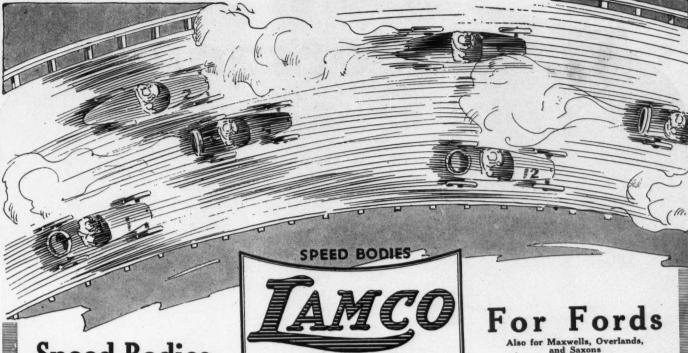
Our selling and distributing plan offers you an unusual opportunity to make big money. Write for it today. Your territory may still be open.

General Gas Electric Co.

Hanover, Pa. U. S. A.



GENCO-LIGHT Light & Power Plant for FARM & HOME



Speed Bodies



Write for Special Prices

Right along, until now, LAMCO Speed Bodies for Fords have cost \$130, from your dealer. Now they are way down to \$65, direct from us. All the salesmen's salaries, distributors' commissions, dealers' profits are knocked off, for you. LAMCO Speed Bodies for Fords have come -

Right Down to the Price YOU Can Afford Because of the Tremendous Demand

The big new addition to the LAMCO Factory is now going full tilt. It is turning out LAMCO Speed Bodies so fast, and in such quantities that production cost is lower than ever before.

That is why we are going to sell to you direct by mail. Three-fourths of the LAMCO business has always been by mail, with all the middlemen getting their commissions just the same.

Now they're out of it. When you order a LAMCO Speed Body you pay for what you buy, and you get rock bottom price—\$65—the lowest price in the world for LAMCO quality, with finely upholstered bucket seats, linoleum covered floor boards, large gas tank, and spare tire carriers, finished in any color without extra cost to you.

\$25 is all you send now—check, money order or draft—and \$40 when your LAMCO Body comes to your door. USE THE COUPON NOW for speedy delivery of the kind of body that rides in the front row when the pace is fastest. Just \$65. Only \$25 down.

IMMEDIATE DELIVERIES

LEHMAN MANUFACTURING CO., Cannelton, Indiana

Top and Windshield Extra If You Want Them Direct to You Order With the NOW NOW

LAMCO SPEED COUPON

Lehman Manufacturing Co.

Enclosed find \$25 for LAMCO Speed Body tor my Ford chassis, remaining \$40 to be paid on receipt

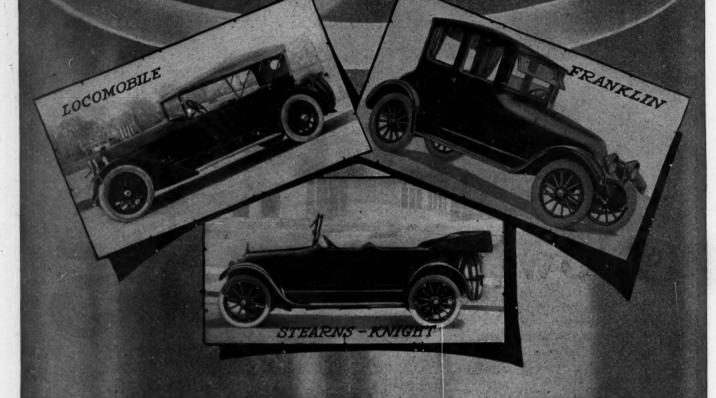
Name

Address

(If for any reason the LAMCO Body you send me is unsatisfactory, I will return it at once and receive back my money, minus shipping charges one way.)

When Writing to Advertisers, Please Mention Motor Age





IN THE LEADING MAKES OF CARS

BOUND BROOK

TRADE MARK REGISTERED UNITED STATES PATENT OFFICE

Bound Brook Graphite & Bronze Oil-less Bushings are used in the leading makes of cars in bearing places that are difficult or impossible to keep properly lubricated.

Bushings that are inaccessibly located are generally overlooked or unintentionally neglected, and lack of proper lubrication means quicker wear and short life for the ordinary plain bushing.

The better the car, the more certain you are to find it equipped

with Bound Brook Oil-less Bushings.

Bound Brook Oil-less Bushings might properly be termed "neglect proof" bushings, for while oiling will add somewhat to their smoothness, failure to oil them does not affect their efficiency. These bushings render smooth and enduring service in spite of neglect.

They represent a form of overinsurance against quick wear and lost efficiency. Being self-lubricating, Bound Brook Oil-less Bushings remain efficient even if neglected.

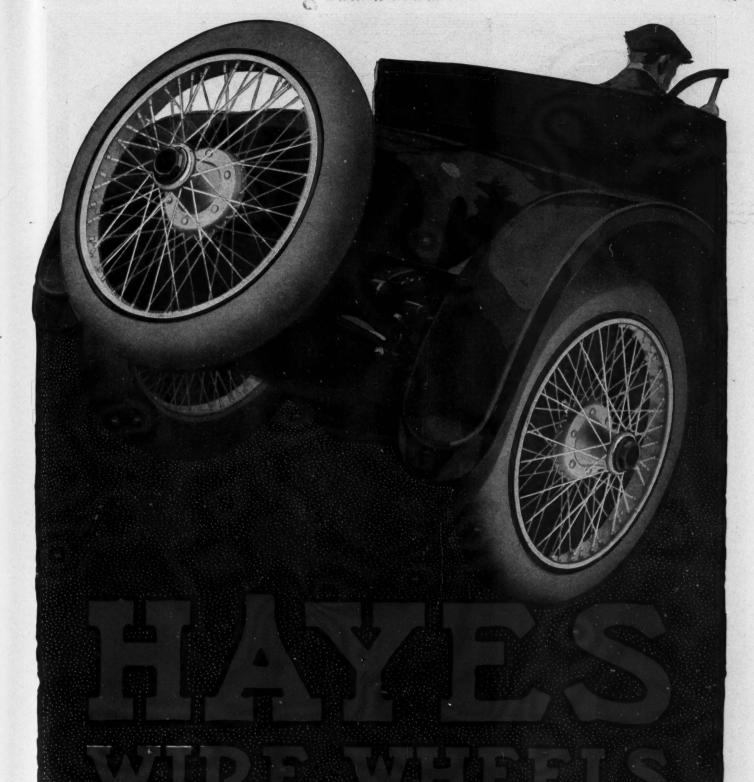
We have specialized in the production of Oil-less Bushings for more than a third of a century.

We will be glad to co-operate with any manufacturer in helping him solve his bearing lubrication requirements.

Also manufacturers of Nigrum (Impregnated Wood) OIL-LESS Bushings.

BOUND BROOK OIL-LESS BEARING COMPANY, Bound Brook, New Jersey

All genuine graphited Oil-less Bushings have always been made in Bound Brook, U. S. A.



Can be changed in eleven seconds without soiling your clothing. Hub caps are furnished with automatic locks—wheel cannot back off—action of wheel forward serves to tighten cap. Write

CASTLE & KYTE 872 Woodward Ave., Detroit, Mich.



BIRD'S EYE VIEW
PERLMAN RIM CORPORATION
JACKSON MICHIGAN. PLANT



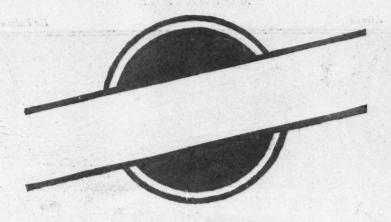
The largest and only exclusive demountable rim plant in the world, covering five acres. The mechanical equipment is new and up to date, ensuring volume and quality production. Producing five thousand sets of demountable rims every working day.

Enough to equip over one million, five hundred thousand (1,500,000) motor cars annually. Prompt shipments of demountable rims in any desired size and quantity.

Perlman S. A. E. Bands and S. A. E. Steel Rims-Are U. S. Army 11/2 and 3-Ton Military Truck Standards-For S. A. E. Demountable Solid Tires - Single and Double.

solicit your demountable rim business, inviting correspondence.

PERLMAN RIM CORPORATION

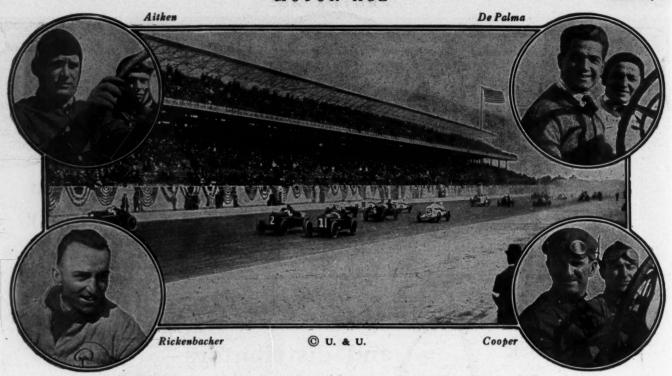


and distributors—small dealers and distributors—share alike in the interest, cooperation, the selling support of the parent company.

This company is now spending hundreds of thousands of dollars to help its dealers and distributors make more sales and greater profits.

See announcement next week

For advance information wire or write MOTOR AGE, 95 West Fort St., Detroit, Michigan. Inquiries marked "Confidential" will be answered direct by MOTOR AGE and so treated.



Why racing drivers use Thermoid Brake Lining

Racing drivers must be absolutely sure of their brake lining. Their lives depend on it.

That is why leading drivers—De Palma, Cooper, Aitken, and Rickenbacher—endorse Thermoid Brake lining.

They know it won't grab or slip.

These cars use Thermoid Brake Lining-

		noid Didnie Dil	B	
Pierce-Arrew	Metz	Sun	Superior Truck	
Studebaker	Cole	Ames	Bessemer Truck	
Chalmers	King	Moon	Sayers & Scoville	
Peerless Marmon	Briscoe Autocar	Pilot	Gersix Truck	
Apperson	Hudson	Empire	Republic Truck	
Premier	Cadillac	David	Fulton Truck	
Auburn	Atlas Truck	National	Columbia Truck	
Haynes	Pathfinder	Kline Kar	Denby Truck	
Kissel	Rauch & Lang		Bethlehem Truck	
White	Denmo Truck	Stevens	Union Truck	
Service Truck	Moreland Truck	Patterson	Hudford Unit	
Lexington-Howard		Lippard Stewart Truck		

These axles use Thermoid Brake Lining-

Timken-Detroit	Peru	Russel	Celfor
Columbia	Sheldon	Empire	American
	Torhousen	Hese	

Why don't you specify the brake lining these experts specify - Thermoid?

Thermoid Rubber Company TRENTON, N. J.



Thermoid
HYDRAULIC COMPRESSED
100% BRAKE LINING



Makers of "Thermoid Tires" and "Thermoid Garden Hose"



More Than 400,000 Now in Use

VICTORY

Is Won by Safety 5-Minute Vulcanizer in the United States Patent Office

DEALERS

Write for a Copy of the Patent Office Decision of May 12

Explains in detail why the United States Patent Office awarded SAFETY Vulcanizer Priority of Invention. IT IS FREE TO DEALERS AND JOBBERS for the ask-

Write for your copy today.

If there was ever any doubt in the mind of anyone, as to the original 5-Minute Vulcanizer, that doubt is now abolished by the award of Priority of Invention allowed SAFETY 5-Minute Vulcanizer, by the U. S. Patent office, May 12, 1917.

SAFETY was first in patents as it has always been first in everything it has ever attempted. There are more than 400,000 SAFETY 5-Minute Vulcanizers in actual use today. The service they give is superior to that of any imitator. And the Patent Office has decreed that it is legally safe to sell and use them.

Every car on the road needs a SAFETY Vulcanizer. It is always ready for immediate use in emergency. Its presence in any tool box may prevent the ruin of an expensive casing, a rim or an inner tube. Just one such experience makes the SAFETY 5-Minute Vulcanizer pay for itself-and then some.

Big Safety sales are waiting for dealers. The demand is universal. The time is seasonable. Write for complete details of the new sales boost—and get in on the profits.

VULCANIZER MFG. SAFETY

213-215 Federal Avenue, S.

MASON CITY, IOWA

One United Tractor Gives You the Service of A Fleet of Trucks

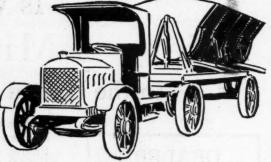
HERE is the way America's leading firms, from those who use big fleets to those who need only one truck, are solving their hauling problems—most efficiently—with the lowest expense.

UNITED Trailer Tractor

and

Several Trailers Pulled Like This





The United does everything a truck can do and many things a truck cannot do. It means one power plant—one upkeep—one motor to supply with gas and oil—one driver's expense for the service of a fleet. It is a powerful Internal Gear-drive Tractor, not merely a short wheelbase truck.

With the United you can haul a 3-ton load more economically than on a truck of 3-ton rating. You can operate a number of trailers of any body type. You can use your old wagon equipment or trailers with stake bodies, or gravity dump, or steel dump with hydraulic hoist.

We Can Supply You With Every Type of Trailer Body Equipment

The United is hauling one load while another trailer is being loaded or unloaded. No idle truck. No idle men. Patented spring suspension at rear relieves tractor chassis of all load weight and gives utmost flexibility. Universal action of rocking trailer platform gives free movement in all directions. Weight distributed on three axles. 60 per cent of load on rear axle of trailer. Has shortest turning radius. Get all the facts about its many exclusive advantages. Write at once for our liberal proposition and full descriptive literature. Or come to the factory.

UNITED MOTORS COMPANY, GRAND RAPIDS, MICHIGAN

Manufacturers of United Motor Tractors and Trucks

A locomotive hauls many times the load it could carry. This is the principle of the United Tractor

When Writing to Advertisers, Please Mention Motor Age

-

Seven-Passenger Touring Car.....\$2475 Four -Passenger Four-Door Tourist 2475 Four -Passenger Coupe 3250

Two-Ton Worm Drive Truck Chassis.... 2285

Prices f. o. b. St. Louis

Getting "Satisfaction

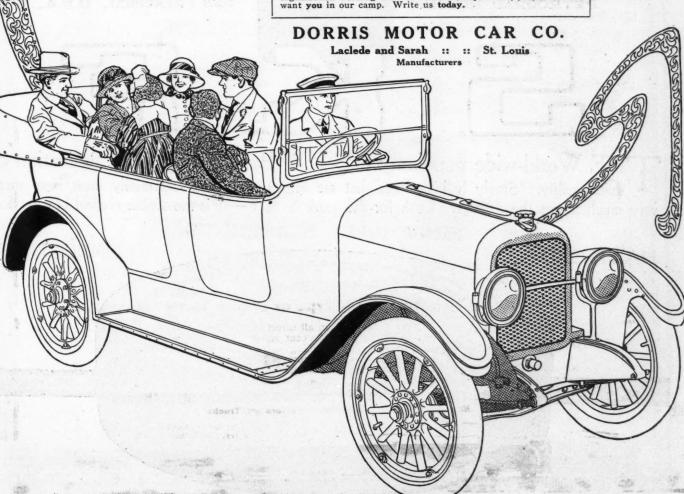
YOU have a right to demand for your money a car that really satisfies. In buying a Dorris you readily recognize what getting "satisfaction" means. Because there's supreme quality in every inch and every ounce of the luxurious Dorris pleasure car.

Designed and perfected by a master engineer, it ranks foremost among the few really high-grade cars in America. Noteworthy a dozen years for unchanged fundamental features accepted as absolutely correct in modern motor practice.



The conspicuous feature of the Dorris is the Original Dorris Perfected Valve-in-Head Motor-a wonder of a willing engine, flexible, sweet-running, economical in its call for fuel and oil. Long, easy-riding platform spring insures extreme comfort.

We have a remarkable proposition to make to live dealers. We back our dealers to the limit with the service of a live, new organization working with an increased capital of \$1,000,000.00. We want you in our camp. Write us today.



When Writing to Advertisers, Please Mention Motor Age



THE World-wide popularity of S K F Ball Bearings is an indication of their quality. Surely ball bearings that are known and used universally must have merit very much above the average. Look for the mark S K F—it is the visible symbol of a service.



When Writing to Advertisers, Please Mention Motor Age



"A Car as Sound as a Liberty Bond"

Special Distributing Propositions

THERE ARE SOME remarkably attractive and liberal distributing propositions open in Iowa, Nebraska, Missouri and Texas for the Jones Six-Sixty line of motor cars.

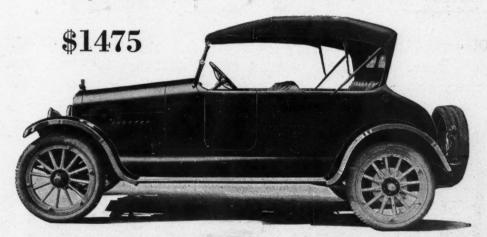
IF YOU ARE NOT familiar with Jones "pleasing appearance and mechanical efficiency" it will be well worth your while to write Department MA for detailed information concerning the most remarkable buy of the 1917 automobile production.

Jones motor cars are designed and built to harmonize with the conviction that there is an ever-growing demand for a moderate priced automobile in which pleasing appearance is combined with great mechanical efficiency.

Jones designers began upon a foundation of sound and approved engineering, and from that base they worked outward to those attributes which have an appeal to the eye.

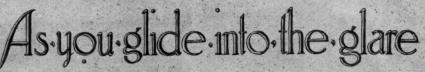
As a result, Jones motor cars are good to look upon and what is of far greater importance they possess the inner worth which can be had only with these engineering principles in accordance with which they were built.

The Jones Six is a medium-priced car with less than medium weight—has all the appearance, power, capacity and ability of the high-priced cars—there is not a line of its beautiful design similar to that selling at a lower figure—in short—it is a car with a \$3,000 appearance and performance selling now at less than half that price.



The Jones Motor Car Company

MANUFACTURERS WICHITA



of entrance lights, in line with the elite of motordom, does your car suffer in comparison with others?

The best way to keep your car looking clean and fresh is to see that the top—the all-important top—is covered with

Pantasote

the most expensive, the most durable and the most admired of all top materials.

The small extra cost of *Pantasote* leaves no excuse for substituting a cheaper material, even on moderate priced cars.

The salesmen of such cars, which use Pantasote, have real talking points on top material.

Tops with Pantasote label are an asset to both dealers and dealers' salesmen.



PIERCE-ARROW LOCOMOBILE

PAIGE-STRATFORD

LOCOMOBILE CHALMERS CHANDLER MARMON HUDSON

COLUMBIA -

MERCER

The Panlasole Company
1708 Bowling Green Building
New York



BUSH WALF-TON TRUCK

The Rush Counterbalanced Crankshaft



The Unbalanced Crankshaft



When You Demonstrate

with a Rush you can throttle the motor down to three miles an hour on high in traffic or you can take the worst hill in your town with never a knock or a jerk. You have stupendous power hooked up with silken flexibility. You have



prolonged life and marvelous economy in gas and oil consumption.

You can race the Rush motor and stand a pencil upright on the radiator.

These are claims — now for the proof.

You know that vibration, unbalanced power, uncontrolled distortion is the bane of the existence of every automobile engineer.

In the field of high-priced pleasure cars the problem has been partially solved by multi-cylinders—overlapping power impulses. But the expense of more than four cylinders in a light delivery truck is absolutely prohibitive.

Rush engineers have eliminated vibration by the adoption of the counterbalanced crankshaft motor.

\$895



EXPRESS BODY

\$965

Next time you pass a railway locomotive take a look at the drive wheel. Opposite the connection between the drive shaft and the wheel itself—on the other side of the hub—you will see a massive weight. If this weight—in perfect balance with the weight of the opposite side of the wheel—were eliminated you can readily see what would happen. With every power impulse the wheel would jerk until the next impulse pulled it over again. The weight absorbs this jerk and by its own momentum applies driving power until the engine provides another pull, through the drive shaft. (See page one of this insert.)

The average pleasure car motor, and all delivery car motors save only the RUSH, are racked by this same jerking every time power is applied to the crankshaft.

Logically, this means distortion—it means a ton of uncontrolled power is loose in the motor tearing and grinding at every moving part.

This vibration is "synthetic" or cumulative, i. e., the jerk comes every fourth or fifth turn of the crankshaft.

The reaction from this jerk resists the motor power. Resistance of every kind must be overcome by using additional fuel—and gasoline costs real money these days.

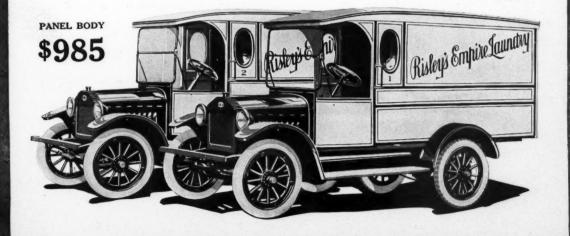
The distortion, the unbalanced power, means friction. The more friction, the more oil consumption. Distortion, vibration, loose power cause wear and tear—high repair bills.

This is a matter of dollars and cents to you because it is the star feature of a list of selling points that are absolutely exclusive to the Rush.

Such a combination of sales material has never before been offered to dealers in a light delivery truck.

Read the specifications on the next page and write for our literature and liberal dealer proposition.

Rush dealers are making fast money everywhere.



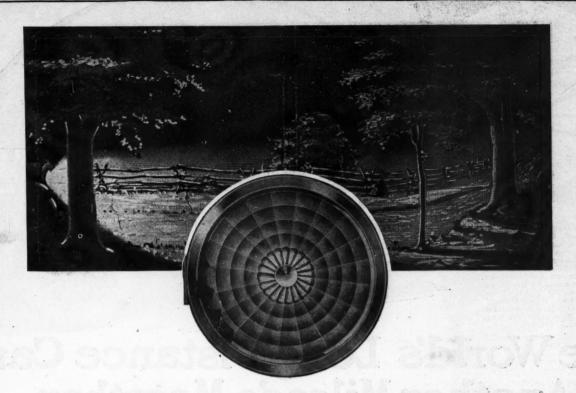


Specifications

- MOTOR: RUSH 3¼-inch bore, 5-inch stroke; developing 29 H.P. at 1600 R.P.M. Four-cylinder monobloc L-head type—three-point suspension—unit power plant, counterbalanced crankshaft.
- STARTING AND LIGHTING: SPLITDORF two-unit system, especially designed for delivery car service. Simple efficient compact weather-proof. SPLITDORF "D'Arsonval" type 15-0-15 range ammeter, positively indicating generator charge rate and lamp and horn discharge.
- IGNITION: CONNECTICUT distributor WILLARD 6-80 storage battery.
- OILING: Automatic constant level pump and splash oiling system.
- CARBURETOR: CARTER clear glass float chamber with Carter easy starting dash adjustment.
- RADIATOR: Vertical tubular, with expansion tank. Capacity, 5 gallons. Armored, fin-type removable casing.
- CLUTCH: BORG & BECK 8-inch dry plate multiple disc clutch. No "stuttering" nor "grabbing."
- TRANSMISSION: COVERT, Model "LB"—selective sliding gear type—three speeds forward and one reverse—center control—extra long levers—40 H.P., special truck design, with oversize gears. All gears high-grade, heat-treated alloy steel. Roller bearings.
- UNIVERSAL: 40 H. P. Universal, double-yoke type, with special RUSH strainrelieving ball thrust yoke.
- DRIVE: Hotchkiss drive, bevel gear type. Straight line from unit power plant through universal joint.
- FRONT AXLE: LIGGETT drop-forged "I"-beam section, with specially designed hubs.
- REAR AXLE: Three-quarter floating type six points of adjustment. BROWN-LIPE differential chrome-nickel steel shafts, specially treated taper roller bearings.
- BRAKES: Internal expanding external contracting operating on rear axle drums, 14-inch x 2-inch ASBESTOS-faced.
- SPRINGS: Semi-elliptic front, 34-inch x 2-inch; rear, 48-inch x 2-inch. Silico manganese steel, eliminating all distortion.
- SHOCK ABSORBERS: Pneumatic air check type, designed to absorb rebound without carrying load.
- STEERING GEAR: LAVINE heavy-duty truck steering gear; irreversible split nut type.
- FRAME: BRILL, pressed steel channel section flexible type, $3\frac{1}{2}$ inches deep, $2\frac{1}{4}$ inches wide, 5-32 inch thick. All cross members pressed steel, hot riveted, with integral gussets.
- WHEELS: 30 inches front and rear, extra heavy $-1\frac{3}{8}$ -inch spokes of selected hickory, fitted with demountable rims.
- TIRES: UNITED STATES 31 x 41 all-round plain-tread front—chain-tread rear.
- GASOLINE TANK: Capacity, 10 gallons.
- WHEELBASE: 105 inches tread 56 inches.
- GASOLINE MILEAGE: 20 to 25 miles per gallon oil, 600 miles per gallon.
- LOADING SPACE: 72 inches back of driver's seat.
- EQUIPMENT: GRAY & DAVIS electric, double-bulb head lights and tail light, electric horn, bumper, jack, tire pump, tool kit and extra rim.
- BODIES: Fore-door panel; weight, 1950 pounds—fore-door, six-post express; weight, 1850 pounds—equipped with windshield, tire rack and rear fenders.

RUSH MOTOR TRUCK CO.

PHILADELPHIA



As Clear as Daylight

The human eye is made to see by sunlight. Sunlight is diffused—It spreads a clear even light over all objects.

is made to suit the human eye. The light they throw, while not so intense, is diffused as the sun's is.

Every object stands out as clearly with a MORE-LITE AUTO LENS as it does in the daylight.

There is no glare with MORE-LITE AUTO LENS.

There is no danger from accidents—with a MORE-LITE AUTO LENS.

There is no danger breaking headlight laws with a MORE-LITE AUTO LENS.

MORE-LITE Auto Lenses fit any lamp. They can be installed easily and without cost.

By their attractive appearance they add to the beauty of your car.

They are the most reasonably priced lenses for their quality on the market.

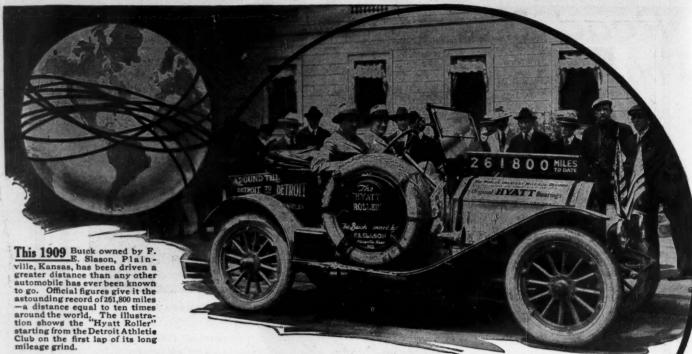
Dealers find More-Lite Auto Lens is a quick seller.

PRICES

Write for liberal discounts.

L. E. Smith Glass Co. Mount Pleasant, Pa.





The World's Long Distance Car on Another Mileage Marathon

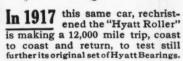
June 4th, this 1909 Buick—still equipped with its original Hyatt Bearings and re-christened "The Hyatt Roller"left Detroit to make this circuit of the country.

After eight years of severe service—equal to thirty years of normal wear-its Hyatt Bearings are running as smoothly as the day they were installed. They show you the continued and unvarying satisfaction you will get from Hyatts in your car.

They are still capable of withstanding the shocks and strains of rough roads and mountain grades. They demonstrate that whatever your local conditions, you will always get the same quiet, carefree satisfaction that distinguish Hyatt Bearings everywhere.

The very age and past record of this veteran automobile make its present performance that much more significant. That is why we are putting it to the test-sending this world's long distance car on this new mileage marathon.

In the results of this tour coast to coast and back again, you will find the reason for making sure that your new car is equipped with Hyatt Quiet Bearings.



It goes by way of Detroit to

Cleveland Buffalo San Francisco San Francisc Portland Seattle Spokane Butte Omaha Des Moines Minneapolis Milwaukee Chicago Buffalo
Albany
Boston
New York
Philadelphia
Pittsburg
Indianapolis
St. Louis
Denver
Salt Lake City

and back to Detroit.

Its coming, and arrival in various cities, will be announced in local newspapers. If you are on the route, watch for the "Hyatt Roller".



HYATT ROLLER BEARING COMPANY, Detroit, Michigan

HYATT The Bearing that Proves its Quality by Performance on the Road

Read What This User Writes



Buffalo Specialty Co... Buffalo, New York.

My experience with AUTO LIQUID VENERA and spraying equipment prompts me to volunteer the statement that it is a most practical and the statement that it is a most practical and the statement that it is a most practical and the statement that it is a most practical and the statement that it is a most practical and leaves a valuable article. The quick and leaves a takes off dirt and mud spots and leaves a trakes off that takes of the car as it melted snow and dried rain does not seem to brilliant, rich polished surface of the car as it does just the untreated varnish, but the water does just the untreated varnish off and carry the dirt with it.

If nickeled parts are, also, L-V treated in the same way, they seem to resist the staining or oxidizing effect of rain and the staining or retain a brilliant polish snow, and better retain a trilliant polish even through the worst stormy weather.

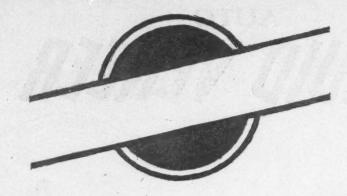
Those who do not use it are really missing something that not only much improves the looks of the car but saves many a dollar-and-half for washing.





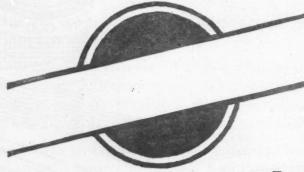
Just One Thousands

COMPLETE OUTFIT, \$1.25. At most dealers or sent direct for \$1.25 if dealer cannot supply. \$1.50 in Canada BUFFALO SPECIALTY COMPANY, Buffalo, N. Y., Bridgeburg, Ont., Can.



the fastest developing section of the United States today—and a most promising one for dealers and distributors who handle this nationally known 5-passenger car and one-ton truck, both priced at under \$800.

See announcement next week



For advance information wire or write MOTOR AGE, 95 West Fort St., Detroit, Michigan. Inquiries marked "Confidential" will be answered direct by MOTOR AGE and so treated.

Something More

-for dealer-as well as for buyer

Most any motor car today is reasonably sure to go.

But it is in the manner of its going that the Cole Eight gives something more.

And this *something more* is just as great an asset to the dealer as to the buyer.

Quiet, well bred, handsome the Cole Eight travels majestically.

Gear shifting is negligible. Comfort is everything.

The fatigue and tension of driving vanish. Real recreation takes their place.

Yet with all its power, all its flexibility, the Cole Eight outeconomizes not only other cars of its type but many that are less powerful.

The Cole Eight is more than a mere automobile. It does more than merely go.

Such a car through its something more to the consumer becomes materially something more to the dealer.

There is an opportunity now for you to become a Cole Eight dealer if you measure four square.

Talk business with us.

Prices

Seven Passenger Cole Eight Touring Car - \$179: Four Passenger Cole Eight Roadster - - \$179: Four Passenger Cole Springfield Tour-Coupé \$229: Seven Passenger Four-Door Toursedan - \$249:

f. o. b. factory and subject to change without notice

Cole Motor Car Company Indianapolis, U.S.A.





Here's a real tip from the tire man

How to save 40% a year on your tire bill

You don't want tire adjustments—you want mileage. You'd like to get 10,000 miles out of every tire you buy.

Very often you get less than the guaranteed mileage. have to go to the tire adjuster and hand over good money. You aren't satisfied; neither is he.

Here is a tip from a tire man on how to avoid the adjustment nuisance, and get the most out of your tires.

He says: "If you keep your tires properly pumped all the time, you'll get about twice the average mileage."

At the very least you will save 40% on your tire bill.

Tire manufacturers say nothing ruins a tire faster than underinflation.

Why hand pump is inefficient

It is practically impossible to keep tires inflated to standard pressure with a hand-pump. It's hard, dirty work. Few men are patient enough to force sufficient air into Soft tires and low mileage altheir tires. ways result.

How to keep tires properly inflated

You need not do back-breaking work to keep your tires properly inflated. For a little more than the cost of a hand-pump-for a small fraction of what underinflation costs -you can buy a Cassco Engine Driven Tire Pump.

99.2% factory built; not assembled

The Cassco Pump is not assembled; it is actually built. 99.2% of the pump is manufactured in the West Side Foundry Co. shops.

We save more than 25% because we do not have to pay profits on the various parts to several manufacturers. You get the benefit the various parts to several manufacturers. of these savings.

Designed by expert engineers

The Cassco Pump was designed by expert engineers. Simple and scientific in design. Takes up little space. Easy to install. Always ready for service. With one easy motion of your hand you can mesh or unmesh the gears. Never out of order.

Dry air; no oil spray

The air from the Cassco Pump is dry and clean. The new Cassco design of piston and cylinder prevents oil-spray. Oil ruins tires.

The Cassco Pump will inflate a 34 x 4 tire to 80 lbs. pressure in 90 seconds. Smaller tires take proportionately less time.

In ordering specify make, year and model of your car.

your car.
Put a Cassco Pump on your car today.

Constantly growing sales

DEALERS: Strong advertising and the merits of the pump are making the Cassco a big seller. We are using half page advertisements in the Saturday Evening Post, Literary Digest, Collier's and Leslie's with a combined circulation of 4,070,000.

We supply dealers with attractive store hangers and booklets for counter distribution. These sales helps enable you to identify yourself with the Cassco national advertising campaign. This means increased sales and extra profits for you. Do not miss this opportunity for extra profits

Write today for full information.

EDWARD A. CASSIDY CO., Inc.

Madison Ave. at 40th St., New York

THE WEST SIDE FOUNDRY CO.



Complete with all fittings including finest gauge made. Easy to install.

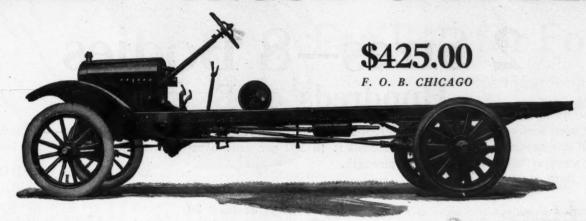
Special for Fords, \$8

Complete with all fittings including gauge. Easy to install.

FPI

The Factory-Built Engine Driven Pump

PERFORMANCE PROVES KELLEY TRUCK UNIT BEST



Internal Gear Shaft Drive

The capacity for the kind of gruelling service described in this letter makes the Kelley the BEST Truck attachment for Fords to buy and the best to sell.

You know that chains are a dead issue—none so poor to do them reverence. No chain is guaranteed for one inch. Must be renewed every 5000 to 7000 miles. Constant expense. Undependable. And when chains break it is sure to be at a time when the truck is loaded.

Internal gear shaft drive combines highest efficiency with highest economy. Delivers maximum engine power direct to wheels. Fully guaranteed—efficiency increases with use!

Read this letter from one of our Alabama Distributors:

"The writer just returned from a trip through the graphite fields of Clay County. "There was a constant downpour of rain for thirty-six hours

"There was a constant downpour of rain for thirty-six hours and roads were considered unpassable, but we got through just the same, making an average of eight and one-half miles an hour.

an hour.

"We have never seen a better performance and are convinced that no other truck would have made this trip under existing conditions.

"Should anyone want to know what the Kelley Unit will do where there are absolutely no roads and nothing but mud and mountains to run over, you may refer them to us."

Kelley Truck Unit is easiest to attach to Ford Chassis. Replaces entire Ford rear system with full truck construction, giving whole rear system of Ford for salvage. Long wheel base; maximum loading space.

1 Ton Model—\$425.00

Guaranteed for 3000 pounds on spring pads. Wheel base: 127"; frame length: 174"; wheels: fourteen 2" spokes; Tires: 32x3½ solid of standard make fully guaranteed by makers.

$1\frac{1}{2}$ Ton Model—\$485.00

Guaranteed for 4250 pounds on spring pads. Wheel base: 135"; frame length: 194"; wheels: fourteen 2" spokes. Tires: 32x4 solids of standard make fully guaranteed by makers.

SOME GOOD TERRITORY STILL OPEN.

Write for Dealers Terms at Once

Kelley Convertible Auto-Truck Co.

334 So. Michigan Ave., CHICAGO

\$1195 F. o. b. Racine
Price will be advanced to \$1250 on July 1st
Mitchell Junior—a 40-h. p. Six
120-inch Wheelbase



\$1460 F. o. b. Racine

7-Passenger—48 Horsepower 127-inch Wheelbase

2 Sizes—8 Bodies Hundreds of Extras

Note what a mammoth field the Mitchell line now covers.

Two sizes of Sixes—\$1195 and \$1460. Both of them larger than rivals.

All styles of bodies, including a unique Club Roadster, a fine Cabriolet and a Convertible Sedan.

And hundreds of extras, to give them distinction over like-class cars.

Unique Attractions

The latest Mitchells offer

31 Extra Features— 24 Per Cent Added Luxury— 100 Per Cent Over-Strength

That is, 31 features—like a power tire pump—most of which all other cars omit. No other car has more than four of them.

An addition this year of 24 per cent to the luxury cost, paid for by savings in our new body plant.

And a doubled margin of safety.

From 50 per cent we have now increased it to 100 per cent overstrength.

Extra Values Free

The Mitchell gives at least 20 per cent extra value over any other car in its class. In large part it comes in things people can see.

This is all due to factory efficiency. To a plant and equipment built under John W. Bate. To methods which have cut our factory costs in two.

Out of those savings we spend mil-

TWO SIZES

Mitchell-a roomy 7-passenger Six, with developed 48-horsepower motor.

\$1460

Price will be advanced to \$1525 on July 1st.

Four Passenger Roadster, \$1495. Sedan, \$2175.
Cabriolet, \$1895. Coupe, \$1995.

Also Town Car and Limousine

Mitchell Junior a 5-passenger Six on 120-inch wheelbase and a 40-horsepower motor.

\$1195

Price will be advanced to \$1250 on July 1st. All Prices f. o. b. Racine lions of dollars to give the Mitchell attractions which others lack.

Everybody Knows

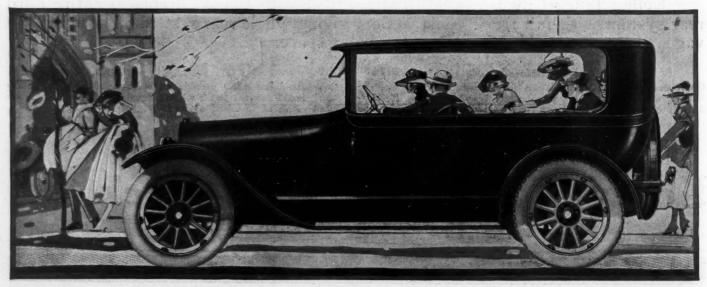
Every possible buyer is going to know these facts. Last year we spent \$700,000 in advertising. This year we are spending \$1,000,000. The Mitchell is now the best-advertised fine car ever brought out in America.

The Mitchell has done what others must do to meet coming competition. We have reduced factory cost to the minimum. We built practically all of the car—including the bodies—under Bate efficiency methods.

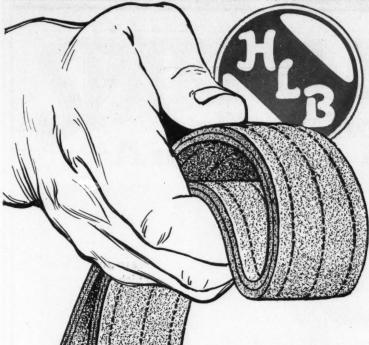
We have multiplied our output 2½ times over in the past six months.

All who are interested in such a car—as dealers or buyers—are arged to investigate.

MITCHELL MOTORS COMPANY, Inc. Racine, Wis., U. S. A.



When Writing to Advertisers, Please Mention Motor Age



Big Profits from This Fan Belt for Fords

sodios Brother

Here's a Fan Belt for Fords that sells at a remarkably low price—TRIPLE STITCH—a fan belt made of two plies of oak-tanned leather stitched with three rows of waxed linen thread—a fan belt that offers you unusual possibilities of profit.

Triple Stitch

Fan Belts for Fords

are but one of a line of Fan Belts for Fords pictured and described in our new 1917 catalog, now ready to come to you. There are WETPRUFE Fan Belts for Fords—the best fan belts we know how to build after almost fifty years of experience. Then there are FLATGRIP Fan Belts for Fords—made of special fan belt leather and selling at a moderate price. And finally comes TEXFORD—a durable, all-textile Fan Belt for Fords.

In addition to Fan Belts for Fords, there are fan belts for all cars, flat "V" and round fan belting in rolls, clutch facings and other dependable automobile materials.

All have back of them the endorsement of leading automobile manufacturers—and will fully satisfy your customers.

DEALERS: Write for our catalog, with name of jobber nearest you.

JOBBERS: Write now for catalog with details of our special proposition to you.

Catalog sent free and gladly. Write now.

HIDE, LEATHER & BELTING CO.

227-A S. Meridian St.

Indianapolis, Ind.

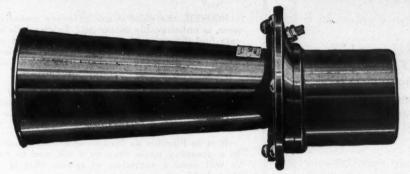
Ball Bearings cost more initially — but they save you car own= ers money.



U.S. Ball Bearing Mfg-Co.

First Choice of America's Best Cars





From a Whisper to a Whoop!

Country or city, day or night, the Sparton Motorhorn provides an adequate and appropriate warning signal.

Its voice may be modulated from the far-flung "Ya-hoo-ta" needed on the winding country road, to the courteous "Passage, please," of the city street crossing.

Forty-two leading motor car manufacturers use the Sparton as standard equipment.

The Sparton Gasoline Vacuum System defeats gravity and automatically feeds gasoline to the carburetor to meet any demand. In one test it raised gasoline 22½ feet; in another it delivered a steady, even supply of gasoline to a motor with 442 cubic inches displacement while running a car at 68 miles an hour.

We assure manufacturers of prompt deliveries.

THE SPARKS-WITHINGTON COMPANY

JACKSON, MICH., U. S. A.

Motorhorns

Gasoline Vacuum Systems

Radiators

Radiator Fans



SUNDERMAN

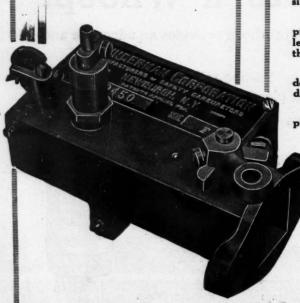
Vacuum Carburetor

\$5

Newburgh F. O. B.

\$6.50 for other than Ford or Metz

Installed on 138
DIFFERENT makes of
cars-on thousands of
motors-and making
good on every one.



"It Has Everything"

The Sunderman Vacuum Carburetor possesses every attribute of the ideal carburetor. Everything that the most expert driver or the rawest amateur could require is present in good measure.

ECONOMY is given in so great a degree that we hesitate to print the average gains from records made by owners who have written in to us. We content ourselves with saying that the buyer is warranted in expecting from 30 to 50% saving in fuel. Remember, we say that claim is conservative.

You Can Prove It Yourself

POWER, the chief desire of every motorist and every engineer, is unbelievably increased. Taking hills on high that other cars find difficulty in negotiating on second or third speed, the Sunderman will go up and over with a pick-up and a burst of speed that will make an owner proud of his car, whether it is a Ford or a Packard.

SPEED—and every man wants it, if only occasionally—can be gotten with a Sunderman carburetor that the car's maker never built into his motor. You won't inhale the other fellow's dust if you use a Sunderman carburetor.

It is as Flexible as Steam—enabling a car owner to throttle to a creeping pace, even on a hill, and to run back and forth at will over a variation of speeds that is nothing less than remarkable.

If there were any way of saying the above more strongly or sincerely, we should say it to you now—and keep on saying it.

Many thousands of car owners and dealers have already proved these statements for themselves. Every mail brings letters of enthusiastic appreciation from private owners and the trade.

The demand is so great—sales so large—and requests for deliveries so urgent—that we have just opened our own foundry to increase our supply of castings.

We want every dealer in the United States to share in the profits that come with Sunderman success.

Write us at once for our proposition—Every owner in your town will give you a profit

Sunderman Corporation

11 Chambers Street

Newburgh, N. Y.

Western Office: 403 Kresge Building



One thing stands out in the mind of today's light car buyer— Multi-Power!

He knows it gives the power-smoothness of high-priced multiple cylinder cars in a fine custom-built automobile, roomy and balanced at \$845.

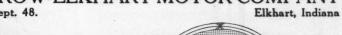
He knows that exclusive Crow-Elkhart construction is responsible for Multi-Powered motoring—that there is no substitute for it.

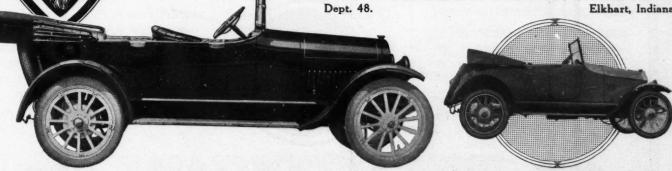
Demonstrations Make Quick Sales

The Multi-Powered car gives your prospect a wonderful demonstration-enthuses him-gets his order before he steps out of the car!

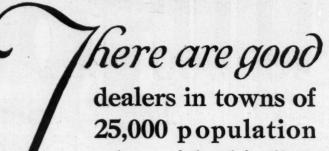
Mr. Dealer, dominate your territory. Secure this valuable agency, if your district is still open. Wire to find out-a letter may not arrive in time.

CROW-ELKHART MOTOR COMPANY



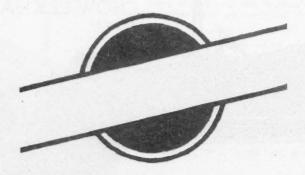


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who with this line have the chance to become big distributors in towns of over 100,000. Possibly you may be hiding your light under a bushel.

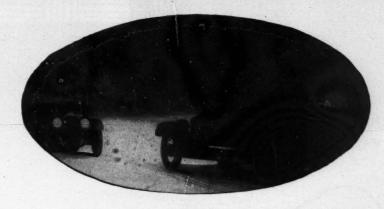
See announcement next week



For advance information wire or write MOTOR AGE, 95 West Fort St., Detroit, Michigan. Inquiries marked "Confidential" will be answered direct by MOTOR AGE, and so treated.

A Flood of Soft Light

Legal Anywhere



Now On 400,000 Cars

Adopted by 17 Car Makers

400,000 Cars Like These Are Selling Warner-Lenz

Consider these facts—you who seek to handle things that motorists want.

The Warner-Lenz has already won 400,000 motorists. And every one of these cars, by every hour of night driving, is proving the need for this lens.

All the new cars of 17 famous makes now go out equipped with Warner-Lenz.

Over 7 million ads every month go out to convert the shaft-light users. And the result every month is some 65,000 new pairs of Warner-Lenz on the roads.

Get the Profit

Here is the sensation of the day in motor car equipment. It is the largest-advertised accessory in this field. Its first-year sales have broken every record among motor car improvements.

Over 3 million cars now running need the Warner-Lenz. Thousands of new cars are still going out without them.

They require little room in a store, small investment,

no after-service. What accessory do you know which compares with this as a big, easy profit-maker?

Why Warner-Lenz?

Warner-Lenzavoid the glare, which traffic laws forbid, without the use of dimmers.

They light the road, the roadsides and the turns, both far and near. There are 176 lenses in one. The whole angle of vision is made as clear as day.

The light is the same in any position. Turning of the lens in the door of the headlamp does not affect it, nor does rise and fall of the car. That is vitally important.

Some sixty types of lenses have been suggested for this purpose. But the Warner-

Lenz is the only one which meets all these requirements.

Its wide adoption—both by makers and owners proves it the coming lens. Write for our dealer proposition and our methods of fostering sales.

Standard Equipment On

PACKARD MARMON STUTZ WHITE PEERLESS FIAT FAGEOL LENOX

RD BIDDLE
N HAL TWELVE
SINGER
McFARLAN
OHIO ELECTRIC
DANIELS 8
PATHFINDER
DOBLE STEAM
CUNNINGHAM



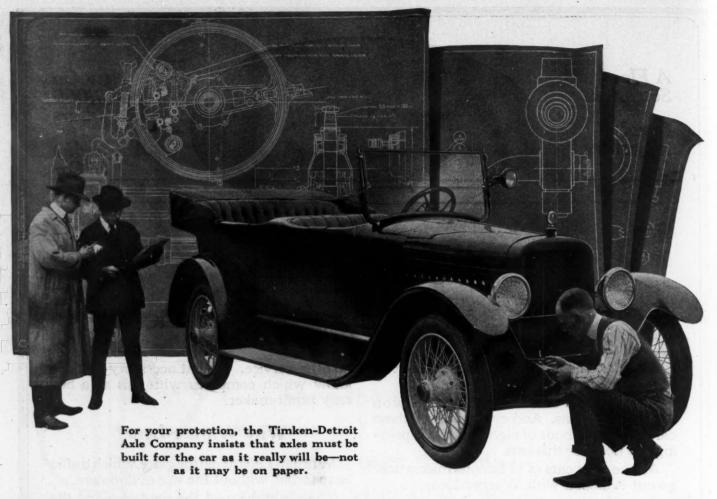
WARNER-JENZ

This is A. P. Warner, of the Warner Auto-Meter Fame, and Inventor of the Magnetic Speedometer.

THE WARNER-LENZ COMPANY

916 So. Michigan Avenue, Chicago





Does the Car Agree with the Blue Prints?

Car builders who use Timken-Detroit Axles cannot include them merely to furnish a selling point; they must be built in-not tagged on.

Therefore, in order to make sure that the car and the blue prints agree, the Timken-Detroit Axle Company insists upon knowing-

First, the weight of each model and type of car into which Timken-Detroit Axles are engineered.

Second, the size and power of the motor.

Third, the distribution of weight on the chassis, front and rear.

Fourth, all other details of construction which in the slightest degree affect the satisfactory service the car owner expects from Timken-Detroit Axles.

Further, the Timken-Detroit Axle Company will not contract to deliver motor-car axles except on definite assurance from the car builder that the car on the street will carry out the promise of the car on paper.

Otherwise, it would be impossible to provide the necessary strength for emergencies, with ample margin of safety to protect you on the roughest roads even to the last mile of many years' service.

The car-builders who use Timken-Detroit Axles could buy other makes at a lower price and under less rigid restrictions, but they willingly pay more in order to give you that extra assurance of safety, satisfaction and service.

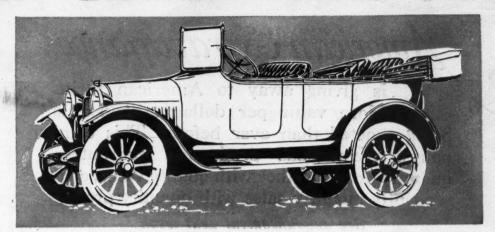
And that gives you a very good reason to believe that they have been especially careful in selecting other parts of their cars—and that these parts are properly co-related and equal in strength and fitness to the work they have to do.



THE TIMKEN-DETROIT AXLE CO. VOIA Detroit, Mich.



Interstate AN EXTRA VALUE CAR



You actually save money if you buy this car now

Extra value as expressed in the Inter-State is due to three good reasons:

First. The Inter-State has been, and is being built on a principle which demands the perfection of one design and strict adherence to that design. This means savings in excessive overhead expense—absorbing high tool charges over a period of years—a steady growth in individual workmanship through familiarity with each operation of manufacturing.

Second. Success can be obtained in building one design for years only by the determination to have the design right in every respect from the outset—and the ability and resources to use materials of such high quality that the performance of such a car will

give satisfaction, and a high re-sale value after one, two or even five years' service.

Third. And the greatest reason for Inter-State extra value now—This established car—backed by years of satisfactory service—is offered you today—at no increase in price since the first of the year—because the materials used in the Inter-State were purchased before "war" prices went into effect.

We have a limited number of these "lower-cost" cars for distribution. Later, we will be forced to use materials at greatly increased prices.

We will never cheapen the quality to lessen the price.

So remember—as long as these cars last—you, the buyer, save money—gain extra value—which we offer to prove to you can not be equaled at the price. Today, before you buy any other car, investigate the Inter-State.

\$950

Six Body Sizes

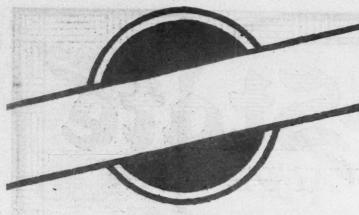
\$850

WRITE FOR ILLUSTRATED CATALOG AND NAME OF NEAREST DEALER

INTER-STATE MOTOR COMPANY

Factory and General Offices

Muncie, Indiana

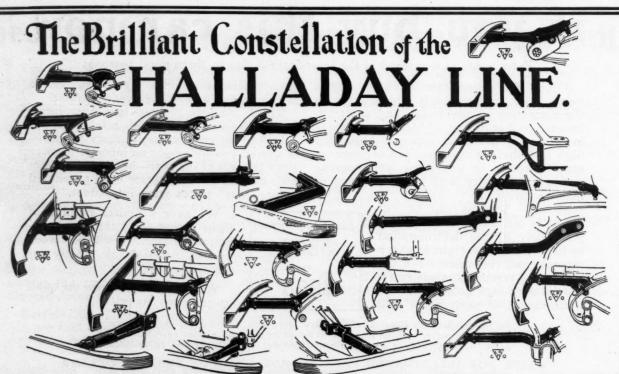


merican Extravagance

is giving away to American thrift. More value per dollar expended is being exacted than ever before. This company's tremendous production guarantees quantity price together with quality value, consequently quantity sales with quantity profits.

See announcement next week

For advance information wire or write MOTOR AGE, 95 West Fort St., Detroit, Michigan. Inquiries marked "Confidential" will be answered direct by MOTOR AGE and so



MR. DEALER: In this galaxy of stars of the Bumper firmament you will find a bumper to fit every car on the road. If you carry this line you can control the bumper business in your territory.

WRITE US OR THE NEAREST DISTRIBUTOR TODAY FOR FULL DETAILS OF THE MOST PROFITABLE ACCESSORY IN THE AUTOMOBILE FIELD

L. P. HALLADAY COMPANY, Streator, Illinois

DISTRIBUTORS: San Francisco, Los Angeles, Portland and Seattle, Pacific Con



HEN your car is equipped with Harvey Springs it inspires you with more confidenceis freed from worries about spring breakage and spring repair bills—you know your springs will withstand heavy strains and the sudden jars and jerks of rough,

A spring that will break is too expensive for you, no matter how low the original cost. Why don't you equip your car with Harvey Springs?—the spring that has no weak spots—the spring that's Guaranteed from End to End—the spring without a single fault. If you break a spring and don't know where to get a Harvey replacement, just ask for the Best Garageman in town—he carries them or can get them quickly. Look for the name "Harvey" stamped on every spring—don't accept a substitute. Specify "Must Be Harvey."

The HARVEY SPRING COMPANY

858 17th Street, Racine, Wisconsin



SPRING SERVICE FOR OWNERS



SPRING SERVICE FOR DEALERS

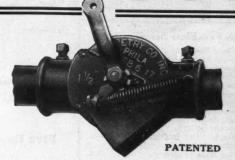
"A real cut-out at last"—such is the opinion of every motorist who has tried the Petry.

Scientifically correct in every detail. Makes a positive cutout through full-sized vent (the largest in the market) of megaphone shape, which materially increases the sound of exhausts. Positively no back pressure. Patented feature on control lever allows of seven adjustments, eliminating, in most cases, the use of pulleys. Easy to operate, easy to install. Spring so located as to be away from all heat. No strain on exhaust pipe. Each size accurately machined and fitted with set screw, making permanently rigid installation.

SPECIAL MODEL FOR FORDS, \$3.50

(Including Pedal and Chain)

JOBBERS AND DEALERS: Write or wire at once. A handsome working counter display is sent with an order for 12 assorted sizes.



Sizes given are outside diameter of exhaust pipe

11/2 inch to 17/8 inch, inclusive, \$3.50 each 2 inch to 23% inch, inclusive, 4.00 each 21/2 inch to 25/8 inch, inclusive, 4.50 each 23/4 inch to 3 inch, inclusive, 5.00 each

N. A. Petry Company, Inc. 1308 Race Street Philadelphia

DISTRIBUTORS:

Geo. L. Holmes, 1733 Broadway, New York City. Grey-Heath Co., 1440 Michigan Ave., Chicago, Ill. Hughson & Merton, Inc., San Francisco, Cal.; Angeles, Cal.; Portland, Ore.; Seattle, Wash.

"Out Again, Gone Again" with Autowline

You can pull your car out of a ditch or mud hole on its own power-if you have a Basline Autowline.

Just fasten one end to a rear wheel, take a turn of the line around the hub, and fasten other end to fence post or tree. Then start your motor and—xingo! you'll be out of trouble in a second!

That's an extra use, of course, for Basline Autowline is made for towing. It's a length of Yellow Strand Wire Rope with patented Snaffle Hooks for attaching. The hooks stay hooked. Basline Autowline is light, powerful, durable, dependable. Price, east of Rockies, \$4.55.

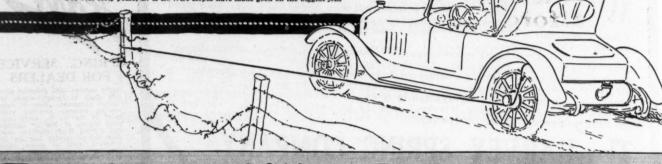
Powersteel Autowlock, another necessity, makes your car and spare tires theft-proof. Price, east of Rockies, only \$2.25.

Buy from your Accessory Dealer. Literature on request



Manufacturers of celebrated Yellow Strand Wire Rope For over forty years, B. & B. Wire Ropes have made good on the biggest jobs





The Original Wire Rope Towline



The Elcar at \$845 **Does Its Own Talking**

Looks better than its price, and is just as good as it looks. A car of distinctive beauty, well designed, well built, well speed; 34.7 h.p. at 1,800 r.p. m.

Fuel Supply—Stewart vacuum system.

Ignition—Delco automatic spark advance with manual control.

Starting and Lighting—Dyneto twounit; double-bulb headlights; Willard finished—a car in which quality speaks right out.

Three Models at One Price

Five Passenger Touring Car Four Passenger Touring-Roadster Two Passenger Roadster

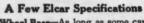
Secure it for your territory We want to place

fore live dealers in territory not already assigned. Write us for particulars, and for our Illustrated Catalog showing all ELCAR models and the more important mechanical parts, and

describing the construction of the ELCAR even down to its small details.

Elkhart Carriage & Motor **Car Company**

C781 Beardsley Avenue Elkhart, Indiana



Wheel Base—As long as some cars selling up to \$3,000 and more—115 in. Motor—4-cylinder; long stroke; high speed; 34.7 h.p. at 1,800 r.p. m.

unit; double-bulb headlights; Willard storage battery.
Clutch — Dry multiple disk — seven plates, steel on Raybestos.
Rear Axle—Full-floating with roller bearings at each end of wheel hubs.
Differential — Spiral bevel driving gears, with roller main bearings and ball thrust bearings.

Brakes—Internal and external, two inches wide on 12-inch drums.

MODEL "D" 5 Passenger Touring Car, \$845



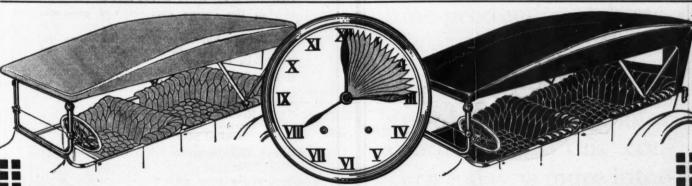
When Writing to Advertisers, Please Mention Motor Age

of all cars are used partly or wholly for business. Economy is demanded of the business car. Big gasoline, oil and tire bills show up disagreeably in the expense record. The light weight, big gasoline and tire mileage of this company's cars is a forcible sales factor.

See announcement next week



For advance information wire or write MOTOR AGE, 95 West Fort St., Detroit, Michigan. Inquiries marked "Confidential" will be answered direct by MOTOR AGE and so treated.



Apply LEATH-R-NU to your dingy top and cushions with an ordinary brush. Lay the brush aside at 8 o'clock. At 8:15 take a spin in your old car made new—top and upholstery a rich, lustrous black, as bright and fresh-looking as they were originally

looking as they were originally.

Not a day wasted. Not even an hour. Just 15 minutes after its application, LEATH-R-NU is dry. LEATH-R-NU spells 1917 to 1916 car owners. It freshens, beautifies and preserves Leather, Mohair, Pantasote and all other leather imitations. Keeps them soft and pilable. Oil, gasoline or water have no effect on LEATH-R-NU. It never gets soft or sticky in warm weather. Will not crack or peel.

Nu-Back Mfg. Co., Dept. C, 114 No. Commercial St., St. Louis, Missouri.

Enclosed find \$1.25 for which please send me a full

Use WATERPROOF MOHAIR TOP DRESSING for leaky Mohair tops. It dyes black while waterproofing. At your dealer's.

DEALERS: Order LEATH-R-NU from your jober. Write him now for prices and full detail

LEATH-R-NU is also fine for refinishing tire coverings, auto trunks, traveling bags; for making brass lamps black, and covering up scratches in the enamel on your car. Use it on anything leather, imitation leather, mohair or metal.

Nu-Back Mfg. Co., Dept. C, 114 No. Commercial St., St. Louis, Missouri. Enclosed find \$1.25 for which please send me a full quart can of LEATH-R-NU. Name City.... Street No..... City.... My dealer is......



DRIDEK Makes a Remarkable Automobile Top

Smooth, pliable, and absolutely waterproof; wears well and looks well; stands up under hard and continuous service.

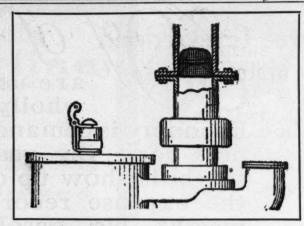
When you put up a DrideK Top—it is something to be proud of.



BULL DOG QUALITY in Rubberized Fabrics and Rubber Cloths, offers an opportunity for the finest automobile tops, curtains and upholstery.

Send for samples and price lists.

L. J. MUTTY COMPANY
BOSTON, MASS.



Solve the Problem of Vaporization

with an

ECLIPSE

VAPORIZER

A mechanical means of breaking up the globules of gasoline which would otherwise resist diffusion in the air, causing waste of power.

Complete vaporization means that all the gasoline in the charge explodes and generates power.

The Eclipse Vaporizer is inserted above the carburetor between the carburetor flange and the intake manifold.

It is guaranteed to-

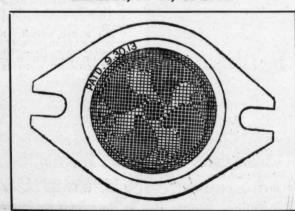
Save 25% gasoline.
Eliminate danger from backfire.
Reduce carbon formation.
Increase power, flexibility and smoothness of your engine.

It costs \$3.50 complete. It is returnable if not satisfactory.

Send us the price with diameter measurement of your carburetor.

Dealers, write for information

ECLIPSE MACHINE CO. ELMIRA, N. Y., U. S. A.



Three Great Friends of Motorists

-from the G. A. C. line.

Combining economy, utility and comfort

G. A. C. Accelerator Foot Rest

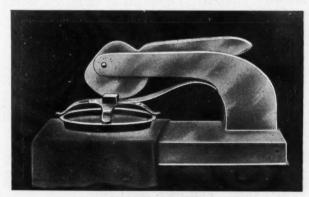
Sudden, continuous lunges on the accellerator result in hardship on the motor and tired, aching legs. The G. A. C. foot rest eliminates any such possibilities. It assures you a constant, even flow of power, a definite saving of gasoline and increased comfort during \$1.25





G. A. C. AUTO TIRE KIT

Every puncture leaves a hole in your tire. Sand and grit will work through resulting later in a blowout. With the G. A. C. Tire Kit you can easily and permanently seal any hole up to a quarter of an inch in the brief time it takes to vulcanize the inner tube. 5 small plugs and 2 large ones \$2.00 included in outfit.

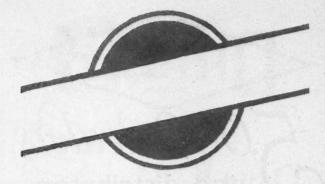


G. A. C. VULCANIZING CLAMP

Send for catalog of other G. A. C. money savers

The General Appliance Co.

129 Federal Street Boston, Mass.



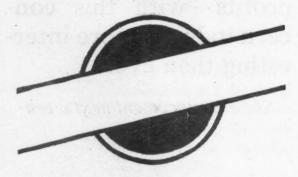
Distributors representing this concern have been uniformly successful—have made money—from the start. 90% recontracted last year. The reasons: volume-production, volume-prices, volume-profits.

The opportunity for bigger business — bigger profits — with this concern today is more interesting than ever.

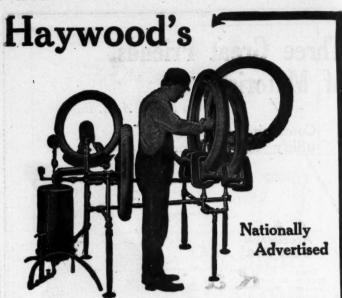
See announcement next week

For advance information wire or write MOTOR AGE, 95 West Fort St., Detroit, Michigan. Inquiries marked "Confidential" will be answered direct by MOTOR AGE and so treated. 5,000 dealers
and distributors
who are now
handling non-competing products,
should with the addition of this car and
truck to their line be
able to multiply their
sales opportunities
and increase materially their earning
capacity.

See announcement next week



For advance information wire or write MOTOR AGE, 95 West Fort St., Detroit, Michigan. Inquiries marked "Confidential" will be answered direct by MOTOR AGE and so treated.



Tire Repair and Vulcanizing Service

In these days of high tire prices, the tire repair business is getting bigger and better than ever, as motorists learn the method of true tire economy. Why not cash in on this opportunity? Put in a Haywood Tire Repair Plant. Link up with a nationally advertised tire repair service. Six years of Haywood's advertising has standardized the Haywood method.

The Sign of the Man and Machine

—is the connecting link between the tire repair man and the automobile owner. It chains the established trade of hundreds of customers to your business. It connects your shop with a national tire repair service—a standardized service—a service that motorists know absolutely to be economical, practical and efficient.

The Haywood System

—is scientific—a true system of conservation of tires—a system that saves motorists thousands of dollars on tire bills. It means repairs that are lasting—vulcanizing that holds—repairs that are solid as the original tire itself, insurance to motorists of no regrets on the road.

Haywood's Tire Repairing and Vulcanizing Plants

The Haywood Plants are complete, all in one unit—are easily operated—no experience necessary. Here is your opportunity to make big money—to add hundreds of dollars in profits a year to your business. Occupies only a small part of your shop—can stand right out in the open where your customers can see it—a constant reminder to keep their tires repaired. Your shop equipped with a Haywood Plant is the motorist's logical haven for tire repairing. It completes your service—a service that customers like—a service that brings and holds business at big net profits.

Write for New Catalog

Use a letter, or post card, or simply send the coupon below. This brings the big book of facts—tells all about tires and how to repair them—shows outfits in use—gives proof of successes—shows how we co-operate with plenty of advertising and plenty of help—how you link up with a national service. Book gives complete details. Write today. Don't delay.

THE HAYWOOD TIRE & EQUIPMENT CO.

720 N. Capitol Avenue

Indianapolis, Ind.

Haywood Tire & Equipment Co.,

720 N. Capitol Ave., Indianapolis, Ind.
Gentlemen: Please send me full particulars of your national serv. e of tire repairing and complete catalog and information of Haywood Tire Repair Plans.

Name

Address



A Radiator Shield that will outlast the car

(RED, WHITE AND BLUE)

A flag wears out, gets shabby, wet and bedraggled.

The ING-RICH Shield not only outlasts the car, but remains bright and beautiful through hard usage and all weathers.

"OLD GLORY" SHIELD

Made of heavy steel and porcelain enameled in red, white and blue. Size $4x4\frac{1}{2}$ inches. Either mounted on the radiator cap, or attached to the front of the radiator itself, this beautifully finished porcelain enameled shield makes a most attractive ornament for a car.

Dealers are selling them faster and faster as motorists' flags wear out.

If your dealer doesn't carry, we will mail to any address, postpaid, one of these handsome patriotic shields on receipt of 50 cents.

Try it on your car, and see what a fine showing it makes. Every car owner will buy one when he sees it.

Dealers, write us today. Attractive, quick seller. Small investment. No risk.

INGRAM-RICHARDSON MFG. CO. Beaver Falls, Pa. Gentlemen:
Send me by return
postOld Glory
Patriotic Shields.
Enclosed find \$.....

LIKE A

JACK-IN-THE-BOX

Do you feel like a Jackin-the-Box every time your Auto hits a bump?

SNUBBERS

Remove the bumps from the road



Gabriel Manufacturing Co.
1415 East 40th Street, CLEVELAND, OHIO





Mud



Make Money Like This Man

He is a garage man and is repairing tires for his storage customers. These cars need to have the tires vulcanized very often and he makes more money from this source than he does from the storage bill or sale of supplies. You can do the very same thing with a

THALEH Vulcanizing Plant

The auto owner, when he comes to you for supplies, gasoline, oil, etc., and knows that you can repair his tires, will gladly give you the job. Give your customers this complete service they like and be ready to repair their tires.

You can easily add \$20 to \$30 more to your daily revenue with-

out adding to your pay roll.

Anybody who can clean or adjust a car can operate a Shaler, because of the simplicity of Automatic Heat Control and

The Shaler Wrapped Tread Method

The Shaler System has been used successfully by tire makers for many years.

Automatic Temperature Control

This is an exclusive feature that keeps the temperature of vulcanizer exactly at the right point from morning till night without any watching or regulating.

New Complete Catalog Free

Write us today for full particulars about the money-making possibilities with Shaler Vulcanizing Plant—the low price and liberal discount. We will also send you our new catalog of the complete line of Shaler Vulcanizers—and our book for dealers, "Common Sense About Tire Repairs."

C. A. Shaler Co., 225 Fourth Street, Waupun, Wis.

The largest Manufacturers of Vulcanizers in the World

EDENTIAL

A Fundamental Necessity For Every Car

The Bailey Non-Stall Differential corrects a basic weakness. Old style differentials let the power go to waste by sending it to the

wheel that does not have traction.

This causes practically all skidding, slipping, stalling, spinning and side-swaying. It is an enormous unnecessary waste of power and tires, and often causes accident troubles and expense.

The Bailey avoids all of this.

With the Bailey no power goes to waste, but all of it is used properly.

It makes you master of all road conditions.

Anybody can install it quickly. It can be fitted to any rear axle.

Owners and dealers should write us for complete information Bailey Non-Stall Differential Corporation, Chicago, Illinois, 1124 Michigan, Ave.



Middle West Transcontinental New England New Jersey	Pittsburgh-Buffalo Southern States Pennsylvania Texas
CITY	STATE

This Is the Plug

The manufacturers listed below equip all their cars with



The Standard Spark Play of America



On Your Car?

Packard Pierce-Arrrow Hupmobile Gray-Dort Dodge Bros Stearns-Knight

Buick National Oakland Davis Detroiter Paterson McFarlan Westcott Lexington-Howard **Daniels** Locomobile. Murray Bour-Davis Premier Knox McLaughlin

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Velie Jeffery Oldsmobile Jackson Apperson Fostoria Pilot Crane-Simplex Singer Stephens Jordan Liberty Scripps-Booth Pathfinder Abbot Anderson Stutz

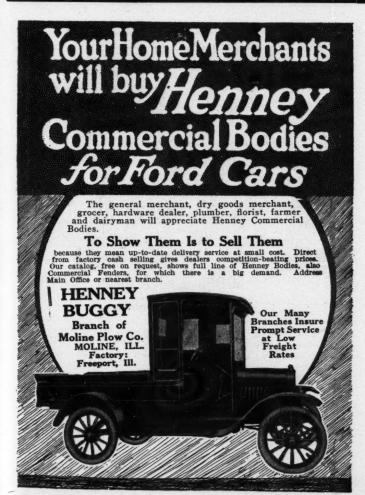
AC is burned into the porcelainsee that your car is AC equipped

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Gramm-Bernstein Henderson Bros. Wilcox Trux Netco Old Reliable Sandow Signal American-LaFrance

CHAMPION IGNITION COMPANY, FLINT, MICHIGAN





Automobile Dealers

See announcement next week

For advance information wire or write MOTOR AGE, 95 West Fort St., Detroit, Michigan. Inquiries marked "Confidential" will be answered direct by MOTOR AGE and so treated.



Policy of giving the dealer his due -passing prosperity around makes a dealer's contract with this concern a cherished acquisition -generally at premium.

For advance information wire or write MOTOR AGE, 95 West Fort St., Detroit

See announcement next week



PIMBLEY'S AUTO TOP NEWER



From OLD to NEW PIMBLEY'S AUTO-TOP-NEWER

is supreme for restoring tops of leather, Pantasote or mohair to their original beauty. A black liquid, applied with a brush. Use it on cushions and trim. Dries in a jiffy—doesn't rub off. Fine for under parts of car, too. At garage, drug, hardware or auto supply store (or write us). 50c, 85c, \$1.50.

PIMBLEY'S AUTO-NEWER

"Cleans and news any exterior finish."

Vastly superior to heavy oils, wax, paste or "polishes." Removes the bluish, streaky cloud. Revives the FIRST finish and keeps it new looking. Something different. 50c, \$1.00.

PIMBLEY PAINT & GLASS
ST. JOSEPH, MISSOURI

DEPENDABILITY



20% Less Gas 30% More Power Less Vibration No Carbon Deposit

Dependability is all that can be asked of any piston. Aluminite Pistons are thoroughly

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Made of aluminum alloy of sufficient strength to withstand the tests of hard service, high compression, high speed, and unusual strain. An Aluminite Piston is less than one-half as heavy as an iron piston of similar size and naturally the strain on the piston pin, connecting rod and crank shaft bearings is lessened in proportion. Less motor vibration, less wear on bearings, longer life to your car and more pleasure in driving, result.

Aluminite Pistons, if they take carbon at all, simply allow it to rest on the surface instead of baking it.

Your repair man will install them for you. Send us the name, model and year of your car for cost quotations.



The Green Engineering Co.

St. Clair Street DAYTON, OHIO

DEALERS

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"100% Efficient"

That's the way one Selden user puts it. He says: We have, under an extraordinarily heavy business, given our Selden Truck a severe test; and in every instance, under all conditions of weather and load, it has proved itself 100% efficient. The truck has given us no trouble and is always ready to start." Selden Trucks are constructed to master the most severe task to which a motor truck can be put.

DEALERS: Write for territory

Selden Truck Sales Co. Rochester, N. Y., U. S. A.

The Most Powerful SEARCHLIGHT

The Most Convenient TROUBLE LAMP



A Searchlight and Portable Trouble Light Combined

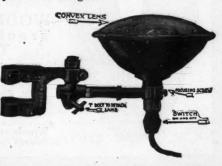
Wherever you go with your car and need a light, for driving, in camp, for fishing, for repairs, SILVERBEAM Searchlight is always ready for use. Besides being a most efficient searchlight—surpassed by none—it is also a trouble lamp you can carry to any part of the car, camp or roadside when you need a light.

Attaches to either side of car, on windshield or door. Black and nickel, black or nickel. Gray, red, blue, etc., on order. When ordering state make, model and bat-tery voltage of your car.

Price \$9.00 complete

with all connections, all nickel or all black Dealers, write for details

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(R-W No. 435 Patented)



A Thing of Beauty and a Joy Forever

Lends architectural attractiveness to the garage. Doors cannot sag nor slam. Slide inside out of the way. Operate in small space. Close tight into door frame.

Sold by the best hardware trade everywhere

Write for booklet, "Distinctive Garage Door Equipment," Sent without obligation

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AURORA, ILLINOIS, U.S.A.

Richards-Wilcox Canadian Co. Ltd. London, Ont. "A hanger for any door that slide





75 To 80 Miles An Hour From Your Ford With These Peugeot Type Cylinder Heads

Your Ford will ramble faster than you can drive it on the road—and it will step way ahead of ordinary Fords on the race course, equipped with ROOF'S Peugeot-Type Cylinder Heads, and 3 to 1 gear ratio.

16 Overhead Valves

-almost double its valve area, and there is absolutely no back pressure in the exhaust outlet.

Easy to install. Set right in the place of the old cylinder head. Special intake manifold included without extra cost. Rocker arms operate from the regular cam shaft. Get our liberal C. O. D. offer. Write for free literature and complete details.

A big year-'round seller. Rush season now on. Dealers, garage and repairmen, write.

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"WHITNEY" TRANSMISSION CHAINS



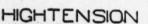
Silent Type

For driving Camshafts, Magnetos, Lighting Systems, Generators, Pumps, Self-Starters, etc.

If you contemplate the use of Silent Chain, don't fail to try the "Whitney"

The Whitney Mfg. Co., Hartford, Com.

Has Your Engine the same comparative power at all speeds, or is it handicapped by the ignition.



SIMMS MAGNETOS

produce their most intense spark at low speeds in the retard and at high speeds in the advance—this means maximum efficiency and flexibility.

It's in the patented pole shoes.

Write for literature

THE SIMMS MAGNETO CO.

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A GOOD TIRE PUMP THEVICTOR

Triple Action



Brass Tubes

Price \$5

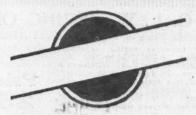
Insures Tire Service and Peace of Mind

JUDD & LELAND MFG. CO. CLIFTON SPRINGS NEW YORK

Chere is a considerable amount, of

pride to be taken in representing a motor car which is internationally renowned—seen and respected in every civilized country on the globe.

See announcement next week

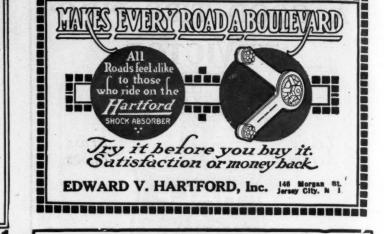


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THE G. L. W. SPRING OILER

Takes the Place of Expensive Shock Absorbers

Absolutely prevents spring breakage, rust, squeaks and crystallization. Adds 30% to tire life. Any spring replaced free that breaks after G. L. W. Oilers have been in place and in use 3 days. Be sure to state width of front and rear springs and make of car when ordering. Two oilers for each spring. Only 25c each. Last forever. Order of your dealer or send direct.

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1,409,000 in Use Today Liberal Dealer Offer Discount to Dealers The Hudson Sales Co.,
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THE HUDSON SALES COMPANIES G.L.W. SPRING OILER ATTACHED, BASIC U.S. PATENTS APRIL II. 1916 May 16 1916

THE STORM & O'HAIR Cylinder Reboring Machine is adjustable and will rebore prac-

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Automobile, Aeroplane, Motor Cycle, Light Marine, Tractor and Stationary Motors. It is simple, speedy and accurate and can be used by anyone familiar

with tools. Indispensable in any repair shop.

Not an experiment but a thoroughly tested and reliable tool.

FOR SALE BY LEADING JOBBERS

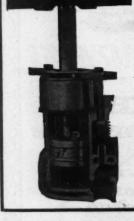
For further information address Storm & O'Hair Company Box 226 Thompson, Iowa

Electric Auto-Lite Starting-Lighting-Ignition Electric Auto-Lite equipment for automobiles is as famous for the service that backs it as for the reliability and economy

ELECTRIC AUTO-LITE COMPANY

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Inner Tubes, Inner Liners, Outer Inner Sleeves, Blowout Patches, Cementless Patches, Cement Patches, Red Rubber Tubing





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DAY OR NIGHT

"Always ready" means "they always work," whether temperature hovers around zero or hits a hundred in the shade. And not only for a few months when new, but year in and year out; in short, a Leece-Neville System is always on the job.

THE LEECE-NEVILLE COMPANY CLEVE LAND, OHIO

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DEALERS—We want to show you what a profitable line the Universal Car Equipment Co. can offer you. Write us today for full information. If you want to handle an exclusive territory proposition we will help you get the business.

Everybody wants to combine Ford dependability and economy with the appearance, comfort and luxury of a high priced car. The man who shows them how is the man who is going to make money. Write us about it today.

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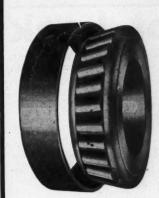


The Hal Twelve

S M O O T H P O W E R

Seven-Passenger Touring Car or Roadster, \$2600. Limousine or Town Car, (Leon Rubay bodies), \$4500. Cleveland prices.

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The Ultimate
Expression of the
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WRIGHT ROLLER BEARING. CO R Crozer Building, Philadelphia, Pa. Factory: Spring City, Pa.

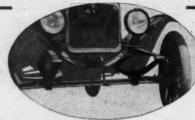


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Rest-More Front Springs Installed on a Ford Car



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REST-MORE SPRINGS

Give "Big Car" Comfort to Your Ford

REST-MORE Patent Spring Suspension for Fords gives you 4 full elliptic 36-in. springs to ride on. Eliminates front radius rod & all spring shackles. Makes riding comfortable, and steering easier. When you order, state whether springs are wanted for touring car or roadster Write Today for Full Details

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Presto Dash and Inspection Lamps

One of the greatest conveniences for night driving—and a popular seller—is the PRESTO Combination Dash and Inspection Lamp that may be extended from the dash to any other part of the car. It shares its importance only with the stationary dash lamps of PRESTO design, essential for convenience and safety.

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Always retains its even consistency regardless of weather or driving conditions. NON-FLUID OIL is a highly perfected friction-killing, long-lasting lubricant that is far superior to any greases. ASK FOR IT BY NAME.

"K-00" Special grade is for gears.

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Dominates Its Price Class In Performance and Appearance

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Save Money, Pain, and Perhaps Disaster!

Carry a Martinkit in your car and be prepared to treat cuts, bruises, burns and even bad wounds accidentally received.

It costs but \$2.00.

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Send for This Booklet

Get the facts about the only high grade, positively lubricated "can-less" Universal Joint for automobiles and motor trucks. WRITE TODAY FOR BOOKLET "E"

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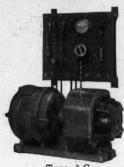


GEARLESS CRANK-SHAFT Tire Pump Pat. Aug. 25, 1915

960,000 PROSPECTS With Cars Between \$800 and \$1300

Now ready for Briscoe, Dodge, Chandler, Hudson, Overland, Reo, Stearns, Saxon 1916, and Studebaker cars. On and off in a jiffy without tools. Not a rubber diaphragm device. Write for details. Dealers, ask for discounts.

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Type 3-G Motor Generator

SAINT LOUIS 4060 Forest Park Blvd. A sure source of profit for

GARAGE and BATTERY STATIONS

Our 3-G Motor Generator charges from one to eight 6-volt batteries at one time. Simplest motor generator set made. Can be handled by inexperienced help—it can't go wrong.

Other Motor Generator Sets for charging up to 24 batteries at one time.

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Price REMO
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Any
MICHENER'S
CHAIN
CARBON REMOVER
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3 for \$2

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REMOVES CARBON Any Time—Anywhere

It makes no difference when you think of it, or where you are MICHENER Chain Carbon Remover is ready to use, without even putting on gloves. Quick and efficient. Inexpensive and harmless.

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E. S. MICHENER

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The Pullmore Front Drive TRUCK

is here

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THE CADY AUTOMATIC JACK

Raises All Four Wheels at One Time

Permits
Use of
Car on
Instant's
Notice



Reduces Tire Expense 30%

Relieves the Tires and Prolongs Their Life

Facilitates Washing, Repairing, Inspecting and Adjusting All Parts of the Car

Write for literature. Positively the greatest money, time and labor saving investment for motorists.

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SOLE HANUFACTURERS OF NON-GRAN AND LARGEST EXCLUSIVE MANUFACTURERS OF BEARING BRONZE IN THE WORLD



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They follow closely the lines of the preceding series, and the only changes are in the nature of refinements.

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Every Brictson Tire is sold under a specific 10,000 mile written service guarantee. This guarantee is the longest and strongest ever put behind a pneumatic tire and is a positive protection to every purchaser. Brictson Tires are Puncture-Proof, and proof against blowouts, skidding, ruts, rimcuts, oil and gasoline. Wonderful resiliency, easy riding qualities and economy commend them to every car owner.

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The long-wearing, rich-appearing motor-car upholstery that can be used to better advantage than genuine leather.

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\$1125 1¹/₄ ton Chassis \$1665 21/4 ton Chassis

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Built to dominate the truck business in your territory—backed by the Bethlehem guarantee and a strong national advertising campaign. Is your territory covered?

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Write Ames for Bodies for FORDS



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Passenger and Commercial bodies, also the Ames-Ton Worm Drive Truck Unit and Commercial Unit. Write

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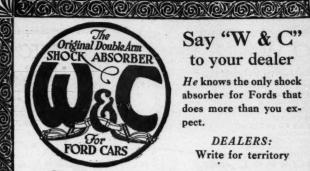


Has created the world's standard in motor truck value

If you are interested in a real money making agency where selling resistance has been reduced to a minimum, communicate with us NOW.

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Say "W & C" to your dealer

He knows the only shock absorber for Fords that does more than you ex-

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Costs but 6c per Cylinder

Easiest - Safest - Quickest Method

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Brake Lining Countersinks

DO IT RIGHT. Essential to every repairman. Cut a clean, even hole in any style clutch and brake lining. 5/16 in. shank can be used—w hether hand drill or power

All well made Tools Price per set of three—\$1.00. Dis-counts from your Jobber.

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Or are you running the risk that lights, spark, starter may fail you suddenly-perhaps on a dangerous road on a black night? Don't guess! Make sure of your electrical equipment by putting.



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It is the reliable means of determining the proper rate of charge or discharge of your battery for various speeds. It enables you to determine that the generator is working and that the storage battery is receiving its proper charge. Write us.

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Easy Starting and **High Compression**

ordinarily don't go hand in hand. But with a



MODEL T OR TK High Tension **MAGNETO**

you get easy starting without batteries, regardless of the compression or grade of fuel used.





Take Uncle Sam's Word

United States Bureau of Standards report on "Liquid Measuring pumps" says:

"The principal causes of short delivery (of gasoline) are leaks in the valves or piping; formation of vapor due to excessive suction lift, or the introduction of air under the piston; failure to correct for the inertia of a long column of moving liquid; the use of long filling hoses with a low connection at the pump, making proper draining of hose an impossibility; short stroking, or operation of pumps at less than full stroke (usually deliberate); and slippage past valves and pistons."

All these causes removed by the

Guarantee Visible Pump

Guarantee Liquid Measure Company
Farmers Bank Building PITTSBURGH, PA. Farmers Bank Building

Visible gasoline and oil pumps

For quality, stamina, strength and general dependability, just test a NATIONAL "Speedway" against the tires you are now using.

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One Quality-The Highest, both In Workmanship and Finish

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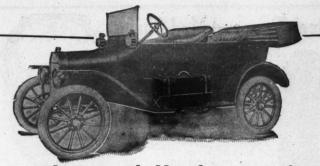












—and especially for touring!

You need this suit case holder. It holds in canvas bag under seat when not in firmly—does not sway or rattle. Carried use. Attached in few seconds.

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Weighs 3 lbs. Will carry 300 lbs. Parcel DEALERS: There is a good profit in this post prepaid if dealer does not handle. and it sells fast. Every motorist a prosprice, \$4.00 (complete with canvas bag). pect. Write for discounts.

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The Most Efficient as well as the Most Popular Rim Compressor on the Market



The Eureka Rim Compressor will remove or replace

It is attached to the rim without the use of clamps or screws. It is quickly applied and operated. It is impossible for it to injure the rims, casings, or tubes, in



BERKSHIRE **Aviation Type**

Pittsfield Spark Coil Co. Pittsfield, Massachusetts Pittsfield,





tires in less than half a minute. Can be used for any detachable rim of the transverse split type.

any way.

The Eureka is strongly made. Guaranteed free from imperfections in material and workmanship. Price, \$3.

EUREKA RIM COMPRESSOR, Inc., Addison, N. Y.



A splendid opportunity for big distributors in the East. announcement next week.



No Mechanical Faults

Three years of study and experiment were devoted to construction of the Keystone shock absorber before it was offered to the motor-riding public. It is scientifically correct. One outstanding feature of the

Keystone Shock Absorber

is the absolute and unvarying "central pull." No side pulls, with the inevitable friction, binding and rapid wearing, so common among devices incorrectly designed. Shock absorbers save the car, the tires and consequently the cost of owning an automobile. But it is important that you get the right kind of shock absorbers.

Per Set \$20. SOME DEALER TERRITORY OPEN

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First Aid for All Motor Troubles Such as faulty ignition, missing explosions from any cause, weak cylinders, leaking valves or pistons, faulty valve or ignition timing, bad carburetor adjustments, knocking in cylinders or bearings, carbon troubles, etc. Made in two models for any number of cylinders.

Write for literature or order today.

PRICES \$2.00 to \$9.50

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Jumbo "Molite" 50c

GUARANTEED For The Life of The Car





Magneto included in the specifications is evidence of the superiority and reliability of that car.

Be Satisfied Specify Bosch

Bosch Magneto Co. 214 W. 46th St., New York

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Universal Cylinder Reboring Tool

The extra profits from cylinder reboring, on overhauling work alone, make a UNIVERSAL Cylinder Reboring Tool a paying investment from the start. Adjustable for any cylinder.

Write for Catalogue A

THE UNIVERSAL TOOL CO.

DETROIT, MICHIGAN

Steel Tires and Mud Chains



old blowout. Can't have blowouts, punctures; neither can the rubber wear off. blowout.

Old Tires Covered Complete Special prices to those in new territory

Kimball Tire Case Co., 173 Broadway, Council Bluffs, Ia.



Anti-Skid

Mud chains can be put on in a jiffy with one hand while standing on the run-ning board. Hook the ends together and push the little lever. If you get in a mud hole you will laugh out loud.



\$1.90 per set of two. Lift the car out instead of digging it in deeper. Thousands in use. Most effective device of its kind on the market. A time and money saver.

Act with steady lift which does not strip the differential gears. Made of malleable iron with strong web strap. Put on or take off in a minute. Occupy small space.

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THE FULTON CO.

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Side



ETRO

Last approximately six months longer than the average battery. They are about 15 percent more powerful in proportion to size and cost.

This is why their sale is now increasing on an average of over 60% every four weeks-a record no other battery has ever approached.

Detroit Battery Co., Detroit, Mich. Eastern Branch: 68th and Broadway, New York City

When Was Your Battery Tested?



It needs occasional attention or it will fail to work when you most need it.

USL Service Stations test all kinds of batteries free

Take yours periodically and let them keep it up to its full strength.

US Light & Heat Corporation, Niagara Falls, N.Y.

In Stock-for Every Car



Write FOR CATALOG

DISPLAY RACK FREE WITH ORDER FOR 12 ASSORTED

Jenkins Vulcan Spring Co.

No uncertainty as to service or wear of

QUALITY FOR REPLACEMENT

e—new nib construction prevents it. Absolute secured with utmost riding comfort. Squeak and rust-proof, installation. For all cars. Quick service. Big discretation C-1917 and prices.

HIGGINS SPRING & AXLE CO. Dept. 21, Racine, Wis.

igh Compression The Accepted Standard' BURD HIGH COMPRESSION RING CO. ROCKFORD, ILLINOIS

Sales Offices in All Principal Cities.

AUTOMATIC IGNITION



Identification!

This Mark identifies Connecticut Automatic Ignition. It appears on the ignition control but-ton of the Connecticut

"The Device of Efficiency"

CONNECTICUT & ELECTRIC COMPANY

Price Only



Does \$25 Worth of Work

Make your own auto trunk at small cost with Presto Clamp



An ordinary soap box, two suit cases and an olicioth cover, board with a \$4 PRESTO Clamp, will serve you as well as better. PRESTO Clamp securely fastens any trunk or box and locks it there. Strongest, quickest, most efficient lugage fastening and locking device. No holes to bore. Ask your dealer or if your dealer can't supply you, send us \$4 for set of 2. DEALERS get attractive prices. Jobbers write

LUDWIG L.BLAKE South Bend





"It starts your Ford and lights it too" Weighs forty pounds. Powerful, compact, sure. Can be installed in five hours or less. Each one war-"USL" Battery Standard ranted. Equipment.

Built by the General Electric Co. Price \$85 f. o. b. Lynn, Mass. Sold Everywhere



A. J. PICARD & CO. General Distributors, Broadway at 61st St., N. Y.

New Two-Unit Starting and Lighting System for Ford Cars

Best for the Ford owner because it is the most powerful, reliable, and long-lived Ford system ever produced.

Best for the dealer because it satisfies and keeps customers and because of its wonderful simplicity. Installing time less than three hours. Removing four through bolts permits inspection and adjustments. Price \$85.00 installed.

Disco Electric Lighting & Starting Corp. DETROIT

Eastern Branch: 68th and Broadway, New York City



On the price of the cars you handle depends the amount of business you do. See announcement next week.

For advance information wire or write MOTOR AGE, 95 West Fort St., Detroit.





PROMEN BEST IN EVERY TIEST When Writing to Advertisers, Please Mention Motor Age

"The Most Advanced Truck in America"

Its magnetic transmission effects a great saving in wear and tear on the motor, chassis and tires—and substantial economy in operating costs.

Two Ton Truck....\$3300 3½ Ton Truck....\$4000

Bourne Magnetic Truck Company
Sedgley Avenue, at North 17th Street
Philadelphia, Pa,

SEAT COVERS



Made of

Laidlaw's Burbank, Limitex and Onyxcloth

Best Quality Bottom Prices

We have on hand all late seat cover models, including 1917 Cadillacs, Hudsons, Chandlers, Chalmers, Buicks, Overlands, etc.

Attractive prices for Dealers. Samples on Request.

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80% More Light Below the Horizontal—No Glare—Perfect for Driving in Fog or Mist

A scientifically designed and perfectly constructed optical device.

The only means on the market by which a headlight can be made strictly to comply with non-glare laws without greatly reducing amount of illumination.

ministion.

We guarantee that with the Ames Deflector a parabolic head-light reflector will project 80%, more light below the level of headlight axis, and over 43% fore than any known so-called non-glare headlight device on the market.

Heinze Electric Co.

Detroit

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Tomahawk Spring
Lubricator

Inject Graphite between the leaves of the springs said get 100% easier riding from your car, works into the pores of the steel and makes a polished bearing between each spring leaf. It lubricates indefinitely. The Tomahawk can be inserted with the pressure of the fingers or a light tap of a hammer, if the car is jacked up.

PRICE \$1.25 EACH

Tomahawk Graphite Spring Lubricant sufficient for 3,000 miles, pr.ce per tube, \$0.50; also packed in display boxes, one dozen each.

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TRUCKS—The Biggest Advance in Truck Construction of the Decade, 1½ and 2½-ton Models

MANLY MOTOR CORPORATION WAUKEGAN, ILL.







The Ford Owner Knows He Needs It

That is why he buys so many of our

Improved Emergency Brakes

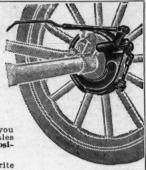
The hub drum is the right place for an emergency brake. Ford owners know this.

You have a big field of prospects and a big thing to sell. We are behind you with our sales helps and a positive guarantee.

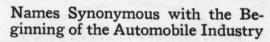
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Jobbers get in on this.

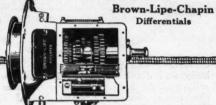
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Retails at \$10 a pair Big Discounts



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BROWN-LIPE-GEAR CO TRANSMISSIONS BROWN-LIPE-CHAPIN CO. DIFFERENTIALS

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Syracuse, N. Y.

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Miles Cheaper

Users Report Records of 8,000 10,000 12,000 15,000 Miles

Quaker City Rubber Co. Philadelphia



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Exceptional men and women find just what they value highly in the Winton Six. Designed to the personal taste of its individual owner, every Winton Six is exclusive; yours is distinctly your own, and it is recognized at sight as superior, out-of-the-ordinary, and good to behold. Let us talk it over with you.

Write today for catalog

THE WINTON COMPANY
424 Berea Road, Cleveland, Ohio

For advance information wire or write MOTOR AGE, 95 West Fort St., Detroit

If you believe all you need is the *chance* to become a bigcaliber dealer or distributor, see announcement next week



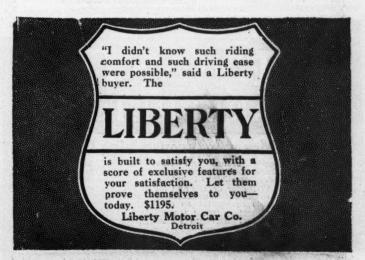
Modernly Designed for Present Day Low-Grade Gasoline

TOM THUMB, Jr. for FORDS—\$15

Send for Illustrated Folder

The National Equipment Co.

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"Confidential" will be answered direct by MOTOR AGE and so treated.

Does the work of 3 horses and more — at less than one - horse cost.

Attaches to any Ford car. The only real-ly convertible tractor unit. Can be con-verted in 15 minutes from automobile to

We can furnish you with a demonstrating outfit at once. It will be shipped on receipt of your order.



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Character and power, expressed in every line of body and detail of mechanism are business-getting selling points that pay. They give the advantage from the start to dealers of MARION-HANDLEY, The Six Pre-Eminent.

Model A 6-40, \$1350 · f. o. b. Model B 6-60, \$1650 Every progressive dealer should know our selling plan. Write.

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LEAD BURNING OUTFIT

The Turner No. 7
Outfit enables
you to burn
storage battery
connections, weld
and braze metals
quickly, efficiently and economically. It operates
with oxygen combined with either illuminating gas, acetylene or
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gas, acetylene or hydrogen. It will produce a very small needle
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THE NO. 7 IS NEW AND ORIGINAL

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THE JIX PRE-EMINENT

THE MUTUAL MOTORS COMPANY

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Products comprise 27 motoring necessities, among which are 2-In-1, Tread Filler, Auto Puncture Cement, Vulcanizing Cement, Radiator-Seal, Rubber-Seal, Carbocide Carbon Remover, Varni - Brite Auto Polish, Tire Talc, Tire Tape, etc.

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Passenger and Commercial Car Motors

Beaver Motors

Fit Every Demand

There are BEAVER Motors in a variety of sizes, suitable for all pleasure car and commercial car requirements. Meet all

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Over-head valves. 20% to 25% more power than other motors of same bore and stroke.

Write today for BEAVER specifications before deciding on the motor to use

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Save Money by Economizing Gasoline

Four floating bronze ball valves opening automatically under different motor suctions supply a uniform mixture at any speed, regardless of hot, cold, wet or dry weather.

Write for details and let us tell you why so many manufacturers are adopting this carburetor as standard equipment.

MADE BY THE OLDEST MANUFACTURERS OF CARBURETORS IN AMERICA

ESTABLISHED 1895 BYRNE, KINGSTON & COMPANY, Kokomo, Indiana

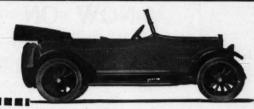




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Dealers in the South and South-East see announcement next week.

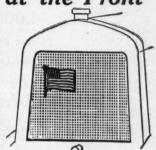


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The car of a Hundred Quality Features—Kisselbuilt from the ground up—distinctively individual in appearance and performance. Inspect it today. DEALERS—Unusual opportunities in unallotted territory. Write or wire us today

KISSEL MOTOR CAR CO. HARTFORD, WIS.

"Put the Colors Permanently at the Front"



Metal Flag

Shield

HIGHLY ENAMELED

Supplied with studs or wire attachment.

Price \$2.00 Each

ALLEN PIN COMPANY 101 Sabin Providence, R. I.

Gordon Easy-On Seat Covers



Add style, class and distinction to any car. They are a mark of refinement and good taste.

They give better service, more comfort, pleasure and satisfaction in riding than bare leather.

They protect clothes from soil and stain; save cleaner's bills; retain the new clothes

look of cushions which adds to the resale value of the

Ask your dealer about them TODAY, or, write the factory for samples of materials and prices of covers that will be "tailored to fit" your car perfectly.

THE J. P. GORDON CO.
No. 308 No. Fourth Street COLUMBUS, OHIO

The Only Truck Attachment that Includes Unit, Cab and Body in one Jobatone Price



Saves you \$75 to \$125 on body equipment. Write for booklet. Get our dealers' proposition.

GRAHAM BROTHERS, Dept. D, Evansville, 1







THE (CLEARING) HOUSE of the Motor Car Industry

or Used Cars, Parts, Accessories, Supplies, Tires, Repairing, Machinery and all other Special Announcements of a Similar Character

ADVERTISING RATES ON REQUEST

Watch this column for great Auto **Part Bargains**

CARBURETORS

Schebler, Model O, 14", \$8.20; Model L, 114", \$10.00; Model R, 1", \$10.00; Stromberg, Type K, 1", \$8.20; Bennett, 114", \$3.95; Kingston and Holly, top intake, 114", \$4.50; for Fords, \$5.40.

WINDSHIELDS

Many types and sizes, price from \$8.00 up. Rain vision ventilating windshields for trucks, complete with rods, \$13.50; rain vision ventilating windshields for Ford commercial bodies, will also fit models previous to 1914, \$10.00. Write for special circular.

FENDERS

Hayes crown fenders for Fords, per set of four, \$13.00; Long slope speedster fenders for Fords, complete with running boards and dust shields, \$7.00; Rear fenders for Ford commercial bodies, flat top, \$3.00; Front fenders for Dodge cars, \$3.00; Many others that will fit most any make of car, \$3.00.

Full floating rear axles, complete with hub for wire wheels and drive shaft, \$75.00; Axles for Krit cars, complete, front, \$15.00; rear, \$40.00; Rear axle and transmission units for Studebaker 25, Maxwell 1914, E. M. F. 30, Everitt 30, \$55.00; Left hand drive front axles, complete with hub for wire wheels, \$25.00. Many others, front and rear, price from \$15.00 up.

SHOCK ABSORBERS

Hartford, with fitting, per set of four, for any make of car, \$25.00; Mondex, regular price, with fitting, \$50.00—our price, \$20.00.

DELCO

Starting, lighting and ignition units, designed for Oakland Model 36 1914, Patterson Model 32 and 33 1914, Buick Model B, 24, 36, 37 1914; Keeton Model 43 1914, Olds Model 42 1914, Cartercar Models 7 and 9 1914 and 1915. Can be fitted to many others; our price, \$40.00.

SPRINGS

Rear springs for Fords, \$3.50.

RIMS

Baker 36x4½, \$3.50; 36x4 and 34x4, \$2.60; 32x3½, \$3.00; Booth 26x4½ Universal, \$4.50; 34x4½ Universal, \$4.50; 36x4 Universal, \$2.50; 32x4 Clincher, \$2.50; 5tanweld, 36x4½ Universal, \$4.50; 36x4 Universal, \$3.50; 32x3½ S. side, \$3.00; Detroit 32x3½ S. side, \$3.00; 36x4 S. side, \$2.40.

BODIES

All kinds and sizes, price from \$15.00 up. Speedster bodies for Fords, will fit any model chassis since 1910, complete with fenders, gas tank, running boards, dust shields, \$55.00.

TOPS

One-man T. C. mohair, \$31.50; rubber, \$28.00; Four-bow T. C. special, \$21.50; rubber, \$23.00; \$20.00;

Write for a copy of our Bargain Bulletin

Puritan Machine Company

ALL PARTS FOR ALL CARS 410 Lafayette Blvd., Detroit, Mich.

We have just purchased an enormous stock of

Originally GUARANTEED for

4.000 MILES

Service and Satisfaction to

All Our Customers

A TRIAL ORDER Will Convince You

All New, Fresh, Selected Stock

Size	Tires	Tubes	Size	Tires	Tubes
28x3	. \$ 6.75	\$1.50	35x4	\$15.50	\$3.45
30x3	. 7.75	2.00	36x4	. 16.00	3.50
30x3½	9.75	2.25	34x4½	. 18.25	4.00
31x3½	. 10.25	2.50	35x41/2	19.00	4.00
32x3½	10.50	2.50	36x4½	. 19.50	4.00
34x3½	12.50	2.55	37×4½	. 20.00	4.00
31x4	. 13.75	2.90	35x5	. 19.50	4.00
32×4	. 14.50	3.20	36x5	. 20.50	4.00
33x4	. 14.75	3.25	37x5	. 22.00	4.00
34x4	. 15.25	3.35			

Add 10% for Non-Skid.

Send \$1 deposit with each tire ordered. Tires will be sent promptly C. O. D., with privilege of examination. Specify style of rim to avoid delay.

Special Proposition to Live Dealers

Tire Repair & Supply Co. 1429 Michigan Ave.

SLIGHTLY USED AND DEMONSTRATING TIRES

OUR-

Mean ECONOMY to Motorists

A Trial Will Convince You

Size	Tires	Tubes	Size	Tires	Tubes
30x3	\$ 4.00	\$1.35	35x4	\$ 7.25	\$1.75
30x31/2	4.75	1.45	36x4	7.50	1.75
31x3½	5.00	1.50	34x4½	7.90	1.75
32x3½	5.25	1.50	35x4½	7.90	1.80
34x3½	5.50	1.60	36x4½	8.00	1.85
31x4	6.25	1.65	37×4½	9.25	1.90
32×4		1.60	35x5		2.00
33x4	7.25	1.70	36x5		2.00
34x4	7.75	1.70	37x5	9.50	2.20
				1	4 - 1

—and remember, whenever you are ready to buy tires to look in these columns first for our advertisement, with the lowest prevailing prices for service.

Send \$1 deposit with each tire ordered. Tires will be sent promptly C. O. D., with privilege of examination. Specify style of rim, to avoid delay.

Aetna Tire & Supply Co. 1463 Michigan Ave., Chicago, Ill.

Tubes Tires Sale

Do not be misled by these low prices. These Tires and Tubes are brand new and were originally guaranteed 3500 to 5000 miles, that you pay so much more

A RARE OPPORTUNITY FOR A SHORT TIME ONLY

	ires	Tubes	Tires	Tubes
30x3\$		\$1.25	33x4½\$13.50	\$3.75
30x3½		1.75	34x41/2 18.00	3,80
32x3½ 1		1.60	35x4½ 18.85	
30x4 1		2.50	36x41/2 19.25	3.00
32x4 1		2.80	37x41/2 19.65	4.00
33x4 1		1.90	35x5 19.00	
34x4 1	4.25	2.20	36x5 20.00	
35x4 1		3.30	37x5 21.50	
36x4 1	15.50	3.50	38x5½ 25.00	

10% more for Non-Skid.

One dollar deposit, or sufficient to cover express cost, required with each mail order. Shipments made promptly, subject to your inspection.

CORRESPONDENCE SOLICITED

AUTO NEEDS COMPANY

1602 S. Michigan Ave.

Thousands of Miles Extra Service in Double Tread Tires

Send us your old Tires and we will Double Tread same for you at prices quoted below:

V	Furnish One	Furnish Both	Double Tread Tire
28x3		\$1.50	\$4.70
30x3	3.65	2.00	5.65
30x3½	4.35	2.50	6.85
32x3½	4.50	2.50	7.00
31x4	4.95	2.50	7.40
32x4	5.25	2.75	8.00
33x4	5.50	3.00	8.50
34x4	5.90	3.00	8.90
35x4	6.30	3.00	9.30
36x4	7.00	3.00	10.00
34x4½	7.50	3.50	11.00
35x4½	8.00	3.50	11.50
36x4½	8.50	3.50	12.00
30X472	8.50		
35x5	8.50	4.00	12.50
36x5	9.00	4.00	13.00
37x5	9.50	4.00	13.50

10% more for Non-Skid.

One dollar deposit, or sufficient to cover express charges, required with each order for complete tires. Shipments made promptly, with privilege

Modern Double Tread Tire Co. 75-77 E. 16th St.

THE MAGNOY

Auto Parts Company

OMAHA, NEBRASKA

BRANCHES:

AUTO PARTS CO., 243 S. Eleventh Lincoln, Neb. Street SIOUX CITY AUTO PARTS CO., 612 Pearl St.
TWIN CITY AUTO PARTS Minneapolis, Minn.
CO., 1215 Hennepln Ave.

SAVING ON ALL PARTS FOR ANY Standard or Orphan Make

We have parts for all the following makes of cars, and a great many others:

We have parts for all the following makes of cars, and a great many others:
Buick F-10-16-17-19-25-29 Auburn 1909 to '14, inc.
Overland 37 to 79, inc.
Flanders 2 and 3 speed
E.M.F.—Studebaker 25
Maxwell A-B-I-E-K-G& Apperson 50
Mascotte & Mercury
Chalmers F-K-M-N-J
and 36
Mitchell T-J-H-K and 6
Mitchell T-J-H-K and 6
Megal 30 & Underslung
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Rambler 34-54
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Cadillac 1909 to '12, inc.
Jackson 32-33-35-40 & 50
Hudson 20-21-33
Velie 30 and 40, 1909 to '12, inc.
Spaulding
Krit 2 and 3 speed

Absolutely

No Delay

Absolutely No Delay

We ship your order immediately. Because our organization is the highest class, and because of the branches in the different parts of the country, we are enabled to give you better, quicker and more satisfactory service. Write, phone or wire us.

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Buick 17\$		Regal Underslung \$ 55
Interstate 13	80	R. C. H., Bosch
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Buick 43	150	Power Plant, Del-
Velie 40	85	co Starter 125
Buick 10	75	Mitchell Baby Six 100
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Flanders, 2 & 3 spd.	50	Buick 31 Unit Power
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HAVE SO MOTORS	ON	HAND AT PRESENT

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DU and DR4's......\$25 DU and DR6's.....\$30 DU and DR6's, Dual. 30 DU and DR6's, Dual. 35

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Weston Mott 20\$25	Overland 69 & trans-
Weston Mott 40 35	mission\$6
Timken Velie 40 40	Buick '13 Full Float-
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Mitchell Full Float-	Jackson 1913 4
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Moon '13 Full Float-	Timken
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These are some of the 5	0 Rear Ends we have o

MAGNETOS-Bosch, Dixie, K. W., Splitdorf,

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RADIATORS—Honey-combed and tubular, \$12.50

RADIATORS—Honey-combed and tubular, \$12.50 to \$20.00.

BEARINGS—All sizes and makes.

TRANSMISSIONS—Reo, Olds, Brown & Lipe, Warren, Hudson 20, Buick 17 and 19, Chalmers Jr., Lexington and many others.

Insure yourself by placing your order with us. All our parts are guaranteed. Satisfaction or money refunded.

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WE CAN FURNISH YOU

best quality serviceable

for all the following makes of cars and many

for all the following makes of cars and many others:
BUICK, Models 10-17-19-25-29-27-14-39-40.
CHALMERS, Models F-K-M-30-36-40.
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MAXWELL, Models A-AA-AB-D-K-E-I-G-22-Mascotte and Special-2.
MITCHELL, Models T-R-K-H-S 6 cyl. 1912 6 cyl.
OVERLAND, Models 30-31-38-49-42-52-59-41-69.
STUDEBAKER, Models EMF 30, Flanders 20-4-14-1915-25 and 1913-25.
Auburn 1911 & '12, Bergdoll, Chase, Courier, Cole 30, Crow Elkhart, Dorris, Elmore, Everett 30, Glide, Garford 30 & 40, Jackson 35 & H, Jeffery, Krit, Lozier, Marion 1912, Moline, Midland, Marathon, Moon, National, Ohio 1910, Oakland 25 & 40, Olds, Paige 25, Perry, Premier 6, Packard 1907 to '10, Rapid Truck, Regals 1909 to '14, Ramblers, Reo 1910 & '11, R.C.H., Studebaker 35, Staver 1913, Stoddard-Dayton, Velie '10-40 & '13.
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If you're the man who appreciates firstclass merchandise that will stand up-A1 serviceable parts-if you're the man who wants his order shipped out the same day received : and have his order filled correctly; if you're the man who wants his money back without any trouble when dissatisfied with the goods

Then You're Just the Man We Want

We're equipped to handle your order to your entire satisfaction.

Our Parts Give Same Service as New Parts

BIG BARGAINS in Motors, Parts,

Accessories

COMPLETE ENGINES

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Mitchell 6, 1912\$100	E. M. F. 30\$ 50
Flanders 20 50	Kline 6 cyl 125
Cadillac, 1909 65	Hudson 33 125
R. C. H 50	Jeffery 100
Overland, 42 80	Imperial 125
Mitchell, T, 1911 75	Premier, 6 cyl 125
Cadillac, 1912 90	

Will sell most any part from these engines. We have a large stock of engines and will trade engines with you.

PRESTO TANKS, size "B," filled, \$3.

NEW PISTON RINGS, 25c each.
For any size—Oversize, 30c each.

REAR AXLES, com-plete, \$20 to \$65. BOSCH MAGNETOS, \$20 to \$35.

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BEARINGS, any make, 50c to \$5.

Any size Hyatt Bearings, \$1.

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Send old sample or give number.

CYLINDERS, A1 CONDITION, almost any

WHEELS, \$1.50 to \$5. Any size or style. Springs, \$1.50 to \$2.50. Spring leaves, 25c to 50c. 50c. (Give length & width).

We tear down old cars for parts; we throw way all worn-out and unserviceable parts, and

Only Good, Serviceable Parts IF YOU'RE IN A HURRY

just take your parts book of your car and deduct ½ of the price in there and write, wire or phone us the order. We will ship parts the same day your order is received.

THE AUTO PARTS CO.

4116-18 Olive St., ST. LOUIS, MO. 325 West 2nd Street, DAVENPORT, IA.

REAL — UNSURPASSED

—Is Made Possible Only by— The World's Largest

NEW and USED AUTO PARTS HOUSE

The

Auto Salvage Co.

INCORPORATED

The Originators of the Auto Salvage Business

17th & Main, Kansas City, Mo. 2823-25 Locust, St. Louis, Mo. 314-16 E. 3rd, Cincinnati, Ohio

Write to Nearest Office
THEN WHY TAKE A CHANCE WASTE YOUR TIME AND ELSEWHERE? : : : : :

When writing to us, it will not be a case of "maybe they got it and maybe they haven't"—because—WE HAVE IT—if it is to be had at all.

ALL PARTS AT

to

Off Manufacturers' Price List ALL PARTS FOR THE FOLLOWING MAKES OF CARS AND MANY OTHERS

Write Us Your Wants

Write Us Your Wants

Apperson 50-5-Bergdoll Maxwell A-G-K-GABuick 10, 16, 17, 19, 21, 25,
33, 39

Brush
Cadillac 1909, '10 and '11 Mitchell, all models
Case—Carter Car
Chadwick—Chase
Crow Elkhart—Cole 6
Chalmers F, K, M, 10,
16, 18, 24, 36, E, J, L
EMF, 1909 to 1912
Elmore
Flanders 2 and 3 speed
Ford N R S and T
Franklin, prior to 1912
Gleason—Glide
Garford—Great Eagle
Garford—Great Eagle
Great Northern
Great Smith—Henderson
Hudson 6-54, 20
Haynes 1913
Herff-Brooks
Hupp 20 & 32
Interstate 30 and 40
Jackson 1910, '11 and '12
Knox
KisselKar 4 and 6 cyl.
Locomobile, all models
Warren—Wayne 40
We have a great stock of complete rear axles, complete motors, transmissions, transmissions

We have a great stock of complete rear axles, complete motors, transmissions, transmission cases, crank cases, crank shafts, disc clutches, transmission gears, bearings, axle shafts, cylinders, cam shafts, radiators, connecting rods, magnetos, coils, carburetors, wheels, hubs, rims, springs, etc., at 50 to 75 per cent off the manufacturers' list price.

OUR GUARANTEE: You Must Be Satisfied. Any article purchased from us, which does not in your opinion give satisfaction or fit, can be returned to us at our expense, and your money will be cheerfully refunded.

FREE Write for new catalog, listing parts and accessories. We can save you money. Write for it today to nearest office. If not of use now, keep it on hand for future reference.

BETTER SERVICE:
Our big business has been the result of giving immediate attention to all orders, no matter how large or small. We can fill your order and have it in the expressman's hands in 4 hours after it reaches our office. Write, wire or phone.

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SAVE YOU 50% TO

"We Tear'Em Up and Sell the Pieces"

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Rambler 44\$ 50.00	Overland 59\$ 75.00
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Lexington 1914, Unit Pla	ant 125.00
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MAGNETOS	REAR AXLES
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FRONT AXLES \$5.00 to \$10.00 TRANSMISSIONS TRANSMISSIONS \$25.00 to \$50.00 GEARS Send old samples. \$6c to \$10.00 GASOLINE TANKS Round, 12x35 in., \$6.00 RELINERS

30x3½ & smaller..\$1.00 32x3½ & larger... 1.50

3x3½ in......\$0.15 4x4½ in......20 We Have Parts For Some of the Cars

Apperson Adams Truck Auburn Abbott Detroit Buick Briscoe
Black Crow
Bergdoll
Brush
Carter Car
Cadillac Case Cutting Cole
Crawford
Chalmers
Detroiter
Dodge
Everett
E. M. F. 30
Flanders
Firestone Columbus
Franklin Cole Franklin Ford, N, R, S Great Western Glide Great Eagle Gleason Great Smith Garford Gartord
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Locomodue Lexington Lexington
Lambert
Matheson Six
Moon
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Maxwell
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\$12.50 to \$20.00 CARBURETORS

\$3.00 to \$15.00 BEARINGS Send old samples. 50c to \$5.00

Send old samples.
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WINDSHIELDS
New and second-hand
\$6.00 to \$10.00
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All Parts Guaranteed in Good Shape Money Refunded if Not Satisfactory WRITE!

Send list of parts wanted for special quotation. Our immense stock is constantly changing and growing.

Auto Wrecking Co. 13th and Oak, Kansas City, Mo. 356 W. 50th St., New York City

(TO FIT)

Abbott M/44 H.P	\$5.00
Bergdoll 30 H.P	5.00
Chalmers 40 H.P., '07, '08, '09 '10, '11	5.00
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Chalmers 36 H.P., '12, '13, '14	5.00
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All of the above FANS are complete with shaft, ready to be installed on cars. They were formerly manufactured by McCord Company of Detroit, Mich.

Blades and Rim are a sheet steel stamping with an aluminum hub. Cones are made from Tool Steel; shafts from 35% carbon steel.

We also maintain in stock complete FANS to fit:-

WARREN PENNSYLVANIA **EWING** HUDSON VELIE R-C-H PULLMAN OLDSMOBILE, Etc.

All FANS listed above are absolutely brand new. We do not carry any second hand or junk parts.

They are also guaranteed against defects for one year.

Have you received our former bulletins? If not, write us at once. They are of vital interest to Owners, Repair Shops or Garages all over the country. They will save you time, labor and expense and give you real "service."

Bulletin No. 13

J. C. Gorey & Co.

YOU CAN'T BEAT OUR PRICES

FOR ALL CARS

can be obtained from us at A SAVINGS OF

U to 80 Money Cheerfully Refunded

If We Satisfy You, Tell Others— If Not, Tell Us

LOOK!!

at the following Bargains:

MOTORS

4 cyl. Continental block motor\$100.00
4 cyl. Wisconsin motor 100.00
6 cyl. Wisconsin motor 125.00
R. C. H. motor 45.00
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4 cyl. Excelsior motor 85.00
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OVER 500 MOTORS IN STOCK So Let Us Know Your Needs

BOSCH MAGNETOS

DU 4 Set Spark\$	16.00
DR 4 & 6	17.50
D 4 & 6 Single or Dual	16.00
DR 4 & DU 4 Variable Spark	20.00
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Remy Mod. RL and D	7.00
New 6 cyl. Remy Distributors	5.50
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COILS
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ALL MAGNETO PARTS

REAR AXLES

Any style or make......\$15 to \$35

SPEEDOMETER HEADS

Stewart or Warner...........\$1.50 to \$4.00
We wreck from 10 to 15 cars Every Day and thus
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RIMS—All Styles and Makes

TIRES AND TUBES

Which Are Good for Thousands of Miles of Service

ARE YOU LUCKY

enough to need the following sizes?

34x4....\$6.00 35x4.....6.00 Prices on Other Sizes Will Interest You MAIL ORDERS SHIPPED SAME DAY Highest Prices Paid for Wrecked Cars

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Largest Car Wreckers in Chicago

1925 S. State St. CHICAGO, ILL. TWO PHONES-CAL. 1388; CAL. 6794

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GUARANTEED-

Read Our Liberal Guar If a tire fails to run 4,000	miles we wil	l replace
it with another tire for or	ne-half regul Non-Skid	ar price. Tubes
28x3\$ 6.80	\$ 7.20	\$ 1.82
30x3 7.20	7.60	1.93
30x3½ 9.30	9.75	2.16
32x3½ 10.70	11.20	2.27
34x3½ 11.95	12.55	2.42
31x4 14.35	15.10	2.97
32x4 14.60	15.35	3.07
33x4 15.25	16.00	3.14
34x4 15.55	16.25	3.23
35x4 16.35	16.95	3.33
36x4 16.85	17.25	3.37
34x4½ 20.80	21.85	4.05
35x4½ 21.60	22.70	4.15
36x4½ 21.90	22.95	4.17
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37x5 25.85	27.15	5.07

Specify When Ordering Whether Clincher,
Q. D. Clincher or Straight Side
2% discount allowed for cash in full with order.
Otherwise, 10% deposit required with order,
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PROMPT SHIPMENTS

Live Dealers—Get Our Money-Making Proposition TODAY

HERCULES TIRE CO. 2128 S. Michigan Ave., Chicago, Ill.

SPECIAL SALE TUBES 5000

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28x3\$1.50	31x4	\$2.2	25 34x	41/2	3.25
30x3 1.60			35x	41/2	3.50
30x3½ 1.75		2.5		41/2	
$31 \times 3\frac{1}{2} \dots 1.85$		2.6		4/2	
32x3½ 1.90					
34x3½ 2.00	36x4	2.8	37×	5	4.10
25% Dep					
CHRI	TOT	-	TOT	-	

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OUR GUARANTEE

If a Tire Fails to Run **5000 MILES**

for one-half the price marke Non-Skid	Tubes
28x3\$ 7.95	\$2.25
30x3 8.90	2.34
30x3½ 10.50	2.66
31x3½ 11.50	2.70
$32 \times 3\frac{1}{2}$	2.79
$34x3\frac{1}{2}$	2.92
31x4 16.80	3.65
32x4 17.95	3.78
33x4 18.40	3.87
34x4 18.95	3.96
35x4 19.50	4.05
36x4 20.30	4.15
34x4½ 22.00	4.95
35x4½ 23.50	5.05
36x4½ 24.10	5.15
37x41/2 25.50	5.25
35x5 27.50	6.05
36x5 28.80	6.10
37x5	6.25
2% discount allowed for cash in Otherwise, 10% deposit require	full with order.

SPECIAL PROPOSITION TO LIVE DEALERS Auto Tire & Rubber Co.

3546 S. Michigan Ave. CHICAGO, ILL.

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We are exclusive owners of all patterns, engineering records, etc., from which Enger cars were made. We alone can furnish prompt, accurate and dependable service on Enger repairs.

ENGER MOTOR CAR CO. INDIANAPOLIS

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We are exclusive owners of all patterns, engineering records, etc., from which American cars were made. We alone can furnish prompt, accurate and dependable service on American repairs.

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We are exclusive owners of all patterns, engineering records, etc., from which Marion cars were made. We alone can furnish prompt, accurate and dependable service on Marion repairs.

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Bimel-Elco

We are exclusive owners of all patterns, engineering records, etc., from which Bimel-Elco cars were made. We alone can furnish prompt, accurate and dependable service on Bimel-Elco

BIMEL AUTOMOBILE COMPANY
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We are exclusive owners of all patterns, engineering records, etc., from which De Tamble cars were made. We alone can furnish prompt, accurate and dependable service on De Tamble repairs. repairs.

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We are exclusive owners of all patterns, engineering records, etc., from which Herreshoff cars were made. We alone can furnish prompt, accurate and dependable service on Herreshoff repairs.

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We are exclusive owners of all neering records, etc., from which L-P-C converse made. We alone can furnish prompt, accrate and dependable service on L-P-C repairs.

L-P-C MOTOR CO.

INDIANA When Writing to Advertisers, Please Mention Motor Age

PARTS AND REPAIRS

We carry in stock for immediate shipment transmission gears and shafts, rear axle gears and shafts, for the following makes of cars:

ABBOTT AEROCAR ALLEN AMERICAN AMES AMES
APPERSON
ATLAS
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CHALMERS
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FEDERAL F. A. L. FEDERAL FIRESTONE FLANDERS GLIDE GLIDE
GRANT
GREAT WESTERN
HALLIDAY
HAVERS
HENDERSON
HUPMOBILE
IMPERIAL
INTERSTATE
JACKSON
KELLY
KING
KISSEL
K-R-I-T
All parts are no

LEXINGTON
LITTLE
LOUVERNE
MGFARLAN
MARATHON
MARION
MAXWELL
METEOR
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MIDLAND
MILLER
MOON
MOLINE
MOYER MOYER
NYBERG
OAKLAND
OHIO
OMAHA
OVERLAND
PAIGE
PALMER-SINGER
PARRY
PARTIN-PALMER
PATHFINDER
PATHFINDER
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PILOT
R. C. H.
REGAL
REPUBLIC
SAMPSON
SCHACHT
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SIGNAL
STEUDEN
SIGNAL
STAVER
STODDARD
STUDEBAKER
STUTZ
SPHINX
STANDARD
SUBURBAN
THOMAS-DETROIT
VELIE
VIRGINIAN
WARREN
U. S. TRUCK
VIM
WALTERS
WESTCOTT
WICHITA
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ZIMMERMAN

All parts are new, and full guaranteed as to material, workmanship and fit. 90% of our prices are from 10 to 50% below factory prices, never any higher. Liberal discount to garages and repairmen. 190 page price list upon request. No repair shop complete without it.

Auto Gear & Parts Co.

NEW YORK	84	4 I	Bighth	Ave.
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ATLANTA	.29	1 N	Agriett	a St.
LOS ANGELES	.12	13 5	S. Hor	e St.

By dealing directly with us you save from 30 to 50% on new radiators and receive a high grade guaranteed Honeycomb radiator that has all the qualities required for efficient service. Our radiator has been adopted as standard equipment by automobile manufacturers.

-RADIATOR REPAIRING-

Auto Radiator Mfg. Company 764-66 W. Van Buren St., Chicago, Ill.

U. S. Motor Parts Co.

404-406 East Eighteenth Street KANSAS CITY, MO.

SAVE 50 TO 80 PER CENT ON AUTO REPAIRS BY COMING TO US.

Parts For:

Apperson Auburn Buick 10, 17, 31, 35, 38, 39—F—14 39—F—14
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Cadillac '09, 11, 12, 13
Cameron
Case, 1912 and '13
Carter Car, '14 (rear end)
Chalmers K & M, 361912, 18-1913-Six 1912, 18-1913-Six Dorris Detroiter E-M-F 30 Everett 30 Elmore Ford, N, R, S and T Flanders 20, 2-speed and 3-speed Gleason Haynes

Hupp 20
Jackson 35
Krit
Lexington 12
Marmon 32
Marion
Maxwell I and Mascotte
Mitchell 11 & 12, Baby
Six, 1912
Overland 41, 52, 53, 54,
69, 79
Oakland 40, 1912
Packard 30, 08, 10
Pierce Arrow
Pope Hartford
Regal Regal Reo 10, 11, 12 R-C-H Studebaker 25 Speedwell Velie 40 Winton Six

MOTORS

Cadillac, 1911\$125	Hupp 20\$ 5
Cadillac, 1913,	E-M-F
starter 150	Flanders 3
Chalmers 36 125	R-C-H 3

REAR AXLES, \$20 to \$50 MAGNETOS, \$5 to \$35

Starters, generators, spotlights, horns, Presto tanks, gas tanks, air pumps, jacks, windshields, tires, wheels, springs.

Everything tagged and shelved so that it can

be found without delay.

Special discount to garages, mechanics and repair shops.

We ship the same day we get your order. Money back if not satisfied. Write us what you need; we answer promptly and with pleasure.

REAL VALUE

MAGNETOS	
Bosch Du-4 variable spark	\$30.00
Bosch Du-4 set spark	25.00
Bosch Du-4 and Dr-4	25.00
Bosch D6 and Dr6	30.00
Splitdorf 4 cyl. Dixie, high tension	25.00
Splitdorf 4 cyl. Models A, T, X and D	10.00
Kurtz 4 cyl. dual with coil	13.00
National 4 cyl., low tension	8.00
Briggs 4 cyl., low tension	8.00
Remy type S, 4 cyl., low tension	10.00
Remy 4 cyl., type R L	
Simms SU4 high tension	22.00

COILS
Splitdorf T S type\$10.00
Splitdorf box type 6.00
Bosch type A 12.00
Bosch vertical high tension 5.00
Remy box coils 6.00
Remy type LC and LE 8.00
Briggs box coils 6.00
DDDGT O LITTLE WALLES

	PREST-O-LITE TANKS	
Model B., Model E.,	fully charged\$ fully charged\$	8.00 7.00

WE REPAIR any make magneto, coil, lighting generator or starter and give 24-hour service. Member Detroit Automobile Trade Association.

DETROIT MAGNETO EXCHANGE
190 Grand River Ave. Detroit, Mich.

ALL

50 to 75% off List Price; all parts for all makes. Motor: Continental Un. Power Plant, \$75; Buick 25, \$55; EMF, \$50; PARTS

PARTS

COUNCIL BLUFFS AUTO PARTS

1329 W. Broadway, Council Bluffs, lowa

GET YOUR

AUTOMOBILE PARTS

Maxwell Bros.

The Largest Auto Parts House in America

50% to

OFF MANUFACTURERS' LIST PRICE

We have in stock at the present time parts or over 500 different models and makes of auto-nobiles. Our slogan is "We Undersell Every-

one."
Our stock consists of motors, transmissions, axles, crank shafts, crank cases, cylinders, camshafts, transmission cases, etc. Below is a partial list of cars for which we can supply all

partial list of cars for parts.
Cadillac, 1909 to 1913
Chalmers 30—F, K. M. 36-40—Master Six
Studebaker—Garford
E.M.F. 30—Flanders
Dorris, 1906 to '09
Peerless, 1906 to '13
Stoddard-Dayton
Cole, 4-50-1913; 6-1913
30-1912; 40-1914
Marmon, 1909 to 1912
National, '10 to '13
Franklin, '05 to '11
Hup, 20 & K
King, '11-'12-'13
Paige, 25-26
Standard, 6
Stevens-Duryea
Midland-Wayne-Welch
Selden-Speedwell
Stearns, 30 to 60
Kissel 6—Matheson
Amplex, all models
Pope Toledo
Oakland 30 & 40
Pope Hartford
Reo, 1908 to '13
Glide-Warren

LOOK AT TH

wnich we can supply all
Locomobile—Knox
Interstate—Jackson
Abbott Detroit
Courier—Glide
Buick, 10-17-19-30
Moon 30-40-45 & C
Maxwell, all models to 13
Packard, 1905 to 1912
Pierce-Arrow, '07-'12
Hudson, 20, 33, 37, 6-54
Ohio-Regal
Bergdoll-Staver
Allen, '15 and '16
Atlas—Speedwell
Mitchell, 1908 to '13
Thomas, all models
Great Western—R. C. H.
Oldsmobile Special
Limited-AutocratDefender-42 and 43
American Underslung
30 to 50—Scout
Case 40 Holliday
Haynes—Carter Car
Overland 38-40-41-42-45
46-51-52-54-55-56-59-60-69-71

LOOK AT THESE PRICES-GEARS. For Any Make Car, 50% Off List. AUTO SPRINGS. All Types, \$2 to \$8. MAGNETOS. \$10 to \$32.50. BEARINGS. 50 to \$7. CARBURETORS. \$3 to \$9.

Don't buy auto parts before getting our prices.

No matter what you need, WRITE US FIRST.

—Special Discounts to Dealers—
GUARANTEE—Every part we ship is carefully examined or tested, and nothing but the very best is shipped out.

MAXWELL BROS.

3921-33 OLIVE ST.

ST. LOUIS, MO.

To All Owners of

Maxwell-Briscoe Stoddard - Dayton **Everitt**

MAXWELL 6-50 WELL 6-50 MAXWELL 4-35 FLANDERS "SIX" BRUSH COURIER-CAR COLUMBIA COURIER-CAR COLUMBIA COURIER CLERMONT SAMPSON "35" MOTOR CARS ALDEN-SAMPSON TRUCKS

The Maxwell Motor Company has transferred to the Standard Motor Parts Company the entire service departments of all of the models above listed, and all orders for repair parts should be placed direct with the Standard Motor Parts Company, New Castle, Indiana.

Better service will be given than ever before, and many reductions in repair parts prices have been effected.

Address all orders and inquiries direct to the

STANDARD MOTOR PARTS CO. NEW CASTLE, INDIANA

MATHESON PARTS FRANK F. MATHESON Wilkes-Barre, Pa.

Bargain Stock List

We are overstocked on some lines of goods and for quick sale offer them at the following bed-rock prices:

17½ set (4 to a set) Gemco Economy Shock Absorbers for Fords— Regular price, \$8.75; sales price \$2.75 6 set (rears only) Sager Shock Absorbers for Fords—

Regular price, \$7.50; sales price 2.00 set (4 to a set) Halladay Shock Absorb-rs for Fords-

Regular price, \$10.00; sales price 2.50 et (4 to a set) Gemco Pneumatic Shock sorbers for Fords— Regular price, \$12.50; sales price 3.50

pair New Era Shock Absorbers, type A r light weight cars— Regular price, \$10.00; sales price 3.00

pair New Era Shock Absorbers, type B or medium weight cars— Regular price \$12.50; sales price pair New Era Shock Absorbers, type C r heavy weight cars—

Regular price, \$15.00; sales price 4.00 5.00

Each 9 only Carter Vacuum Tanks— Each 5.00 Dixon's No. 5 Cup Grease in one and five pound cans-

Per pound All of the above stock offered subject to prior

"First come, first served."

Vehicle Top & Supply Co. 3414 Lindell Ave., St. Louis, Mo.

USED MOTORS

FOR IMMEDIATE DELIVERY Overhauled and Guaranteed

-Largest Stock in America to Choose From For Sale: 3 Phase, 60 Cycle, 220 Volt

H. P.	Speed
1-3 -General Electric	
1-3 -Westinghouse	
1-5 -Wagner	
1-5 -Allis Chalmers	1200
1- 71/2-General Electric	
1-10 -Westinghouse	
2-15 -Westinghouse, Type CCL	1750
2-15 -Watson, slip-ring, var. spee	d. 1720
1-15 -Fairbanks-Morse	
1-15 -General Electric, Form L	1200
1-15 -General Electric	
3-15 -Fairbanks-Morse, slip-ring,	
constant speed	
1-15 -Westinghouse, vertical	1135
2-15 -Allis-Chalmers	1130
2-15 -Allis-Chalmers	
2-15 -Westinghouse	
4-20 -Westinghouse	1750
1-20 -General Electric	1200

Send for Monthly Bargain Sheet showing com-plete stock and net prices.

Gregory Electric Company

16th and Lincoln Streets CHICAGO, ILL.

MOTORS AND PARTS

Overland 69 Motor\$75.00	į
DR4 Bosch Mags 20.00	
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32x31/2	10.50	11.00	34x41/2	20.00	21.75	
34x31/2	11.75	12.50	35x41/2	21.50	22.50	
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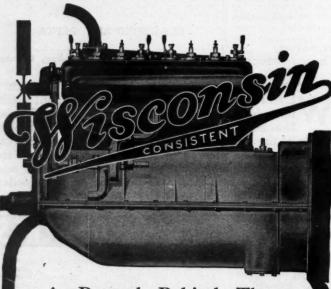
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